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American Industry and Public Policy

By James A. Emery
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THE lifetime of the United States measures the origin and development of what we term "industrial civilization." Within a century the characteristic simple, independent, agricultural society of the Napoleonic era has been transformed into a complex interdependent industrial civilization. Its material security rests upon the continuity, efficiency and development of its economic system. This, in turn, is more profoundly influenced than ever before by the course of government toward the human agencies and instrumentalities of business.

Substantially coincident with what is commonly described as "the industrial revolution" occurred the American political revolution. Its philosophy energized human effort more powerfully than steam stirred mechanism. It gave a new direction to human purpose, new hope to the heart, new opportunity to the multitude, new security to the fruit of individual achievement. Under its driving force the little handful of agricultural colonies scattered along the wild Atlantic seaboard have become politically the most powerful and influential of nations and economically the largest wealth producer and the most comfortably living of human societies. Today the mass of Americans enjoy more convenience, comfort and luxury at a cheaper price than was ever before within the possession of a single people. To conserve, promote and perpetuate these advantages is at once a private and a public purpose.

The problems of the direction of our industrial affairs are not merely technical or economic. They are political and social. For, however difficult in themselves, industrial production and distribution must be carried forward in a constantly changing political medium. All the delicate human adjustments involved are constantly being translated from the business field in which they arise to a political field which may offer a very different answer. To an ever-increasing extent the business of local and national government has become the government of business. Never before was the attitude and intervention of public authority of such vital significance not merely to the directors of production and distribution but to their shareholders and the public.

It must be obvious that reasonable stability in public policy is an indispensable condition for investment and development. Nor is public policy to be confined with legislation, however important that may be. The former is the major premise of which the latter is but the minor. Public policy should express the more permanent course which government intends to pursue as distinguished from the temporary methods by which it may seek to accomplish its ends. Thus the United States may own and operate a merchant marine, although its objective is private ownership and control. The recognition or non-recognition of a particular régime in Mexico or Russia may mean commercial loss or gain to the business of the day, but far more important is the determination by the United States that it will recognize no form of government which refuses to meet international obligations, assure the sanctity of contracts and the safety of life and property. No form of railroad regulation can be so important as the settled determination that our transportation service must be adequate, uninterrupted and efficiently operated at reasonable cost to the shipper and with a fair return to the carrier.

Indeed, until public policy is clearly and permanently defined with respect to any important subject its expression in legislation is correspondingly ambiguous and unstable. The uncertain restrictions of the anti-trust acts will never be clarified until we determine whether as a matter of public policy the common welfare is best served by always compelling competition or recognizing and regulating beneficial co-operation.

There is a saying that one sometimes finds it hard to see the forest because of the trees. That thought applies to many of us in the machine industries who are so engrossed in the immediate problems of the day that there is no time left for contemplation of the big picture of which industry is only a part. Mr. Emery is in a particularly favorable position to study the relations of industry to national affairs. The series of articles, of which this is the first, will give his carefully considered opinions on the relations of industry to public policy, taxation, immigration and other phases of governmental activity. They are authoritative and broadening for one's general outlook.

How shall we improve our taxing system without first deciding whether its primary purpose is to raise revenue or redistribute wealth?

Nor is the need of stable public policy confined to our domestic affairs. After five years of flux, the Dawes plan substitutes a permanent basis of economic relationship between the European states for the shifting political policies of changing ministries, and is not less potent in its influences upon American trade.

So the slightest reflection upon our history and immediate experience but serves to emphasize the critical relation of governmental policy to private tasks. Our commercial history since the Civil War, and particularly from the beginning of the present century, is one of halting hesitation on the eve of dubious elections threatening serious political change. Yet American industry, in management, investor and worker, represents the co-operation of the most amazing wealth producer and civilization server any people have ever possessed. But its progress necessitates not only sound but stable policy. That is the indispensable condition for the progressive development and application of the fruits of research and invention through the aid of expanding investment and permanent employment. These conditions are assured only through clear and definite understanding of the relations of government to our economic operation, so that the future may be faced with increasing certainty. We need, therefore, not tax legislation but a policy of taxation, not agricultural legislation but a policy toward agriculture, not hundreds of transportation proposals but a transportation policy, not a flock of schemes to regulate associated effort but a clear-cut policy for business co-operation.

A popular government cannot operate itself. It merely affords instrumentalities through which the intelligence of the electorate must operate. For the manufacturer, the engineer, the merchant, the railroad executive or the farmer must not leave to the politician the solution either of the special or the general problems of each industry or the nation. But each in its own sphere must undertake to meet its own, to arrive at self-government in its own industry and co-operate with its fellows at all points of contact, that they may arrive at a larger voluntary control over themselves which will stand in all particulars the test of the public interest. This points a way, through experience and common sense, to establish a common law for each industry. It offers a practical means of self-correction which ought to make a persuasive appeal to the critical public.

Our ideals and our experience alike urge that business men, individually and collectively, shall take an active interest in shaping public policy, both as a political duty and a business necessity. To take the same interest in the qualifications of a political agent that one takes in the selection of a sales agent is the plain counsel of a good sense. To make available for authority-formulating policy the special knowledge and experience of an individual or an industry is a sound commercial counsel as well as a political obligation. To set up in each industry the practice of imposing intelligent self-restraint in business conduct is to establish the kind of practical self-government which is the very essence of the American system and which, fairly practiced, tends to reduce the excuse for political intervention to a minimum.

The Constituents of Bearing Metals

By L. D. Allen

The metals used in the manufacture of the various babbitt metals, type metals, solders, etc., are two or more of the following: tin, lead, copper, antimony and bismuth.

Tin is a white metal with a yellowish tinge. It toughens the alloy, lowers the melting point and assists in producing a strong, homogeneous mixture. It is a "dry" metal, that is, it is somewhat lacking in antifrictional properties. Under heavy load it heats quickly and fuses. It melts at about 450 deg. F., its specific gravity is 7.35 and comparative hardness 4.5. The grades generally used in the manufacture of babbitt metals are known as Straits, Chinese and Bolivian, depending upon the standard of purity required.

Lead imparts softness, lowers the melting point and reduces the tendency to heat. It reduces friction more than any other metal and resembling graphite in this respect. It melts at about 620 deg. F. Its specific gravity is 11.38 and its comparative hardness is 1.5.

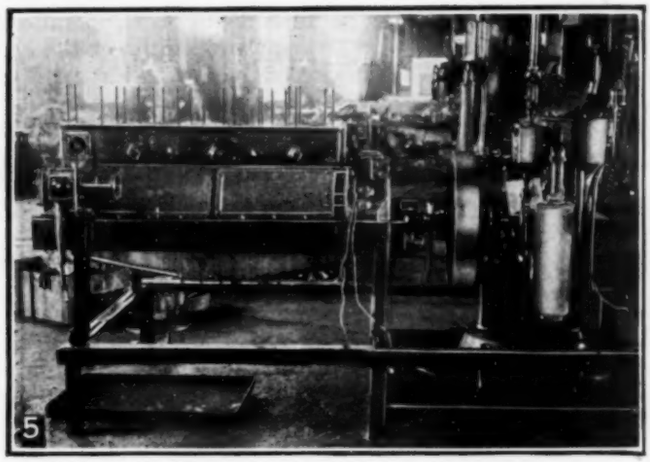
Copper hardens and toughens the alloy and raises the melting point. It slightly increases the friction. It melts at a temperature of 1940 deg. F. Its specific gravity is 8.85 and its comparative hardness is 2.5. Copper is the basic metal in bronze and brass. Very little of it is used in babbitt metal, the usual range being from 0.25 to 0.50 per cent in a lead-base babbitt. There are some mixtures, however, that contain as much as 10 per cent copper, as for instance "Hard Genuine" babbitt that contains 80 per cent tin, 10 per cent antimony, and 10 per cent copper. Copper and lead do not alloy well. The writer does not care for copper in a lead-base babbitt metal; it hardens the alloy somewhat, but it reduces the anti-frictional qualities.

Antimony is a hard brittle, bluish-white metal of crystalline structure. It hardens an alloy and raises the melting point. It reduces the friction and consequently the heat. It melts at about 1,170 deg. F. Its specific gravity is 6.76 and its comparative hardness is 3.5. The crystalline grain in a babbitt metal is due to the presence of antimony.

Bismuth reduces friction and prevents shrinkage. It lowers the melting point and expands on cooling. It melts at a temperature of about 507 deg. F. Its specific gravity is 9.82 and its comparative hardness is 2.3. As bismuth usually costs more than $2.00 per pound, it is not often used by manufacturers of ordinary babbitt metal.

Aluminum is rarely used in a babbitt metal. It melts at a temperature of about 1,160 deg. F. Its specific gravity is 2.6 and its comparative hardness is 2.2. It imparts some toughness to the alloy by closing the grain and acts as a flux.

Certain combinations of tin, copper and antimony shrink on cooling. Tin and lead alone shrink slightly and antimony remains about constant. An alloy of two metals melts at a lower temperature than the original metal having the higher melting point, and sometimes at a temperature lower than the metal with the lower melting point.



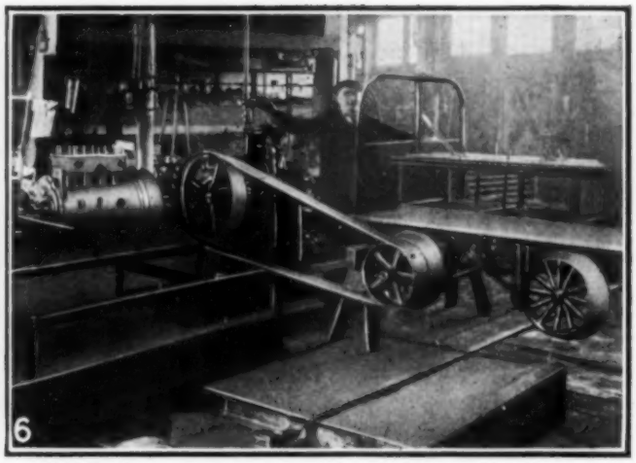


Fig. 5—"Running-in" a Sea-Gull motor. Fig. 6—Running in the motor of a track car

Maintenance of Gas-Rail Cars on the New Haven Railroad

Steam engine run by compressed air—"Running-In" motors—Electrical equipment for ignition and lighting —Types of motors and transmissions—A turntable motor

AN IMPORTANT part of the shop's equipment is a small steam engine that has been fitted to be run by compressed air from the shop mains. It is used to "run in" the engine after repairs and replacements have been made upon the moving parts, especially new pistons or rings. An engine to be run in is placed upon a frame, as shown in Fig. 5, with its crankshaft approximately in line with the shaft of the steam engine, to which it is connected by a universal coupling. Air is then turned on and the engine allowed to run at about 100 r.p.m. for several hours.

The same source of motive power is used also to run in the motors of the small track cars. For this purpose the car is set up on a couple of horses as in Fig. 6, a suitable pulley clamped to the hub of one of the track wheels, and the machine driven by a belt from the flywheel of the little engine. Neither arrangement interferes with the other, and two engines may thus be run in at the same time if desirable.

All of the Sea-Gull engines are equipped with a dual ignition system, operated by current from the generator or battery on one side and from a Bosch magneto on the other. The electric generators supply current as well for the lighting system of the car, and the voltage is 32, the same as is used upon all standard railway lighting equipment.

In Figs. 7 and 8 are shown parts of the electrical repair department where all of this class of equipment

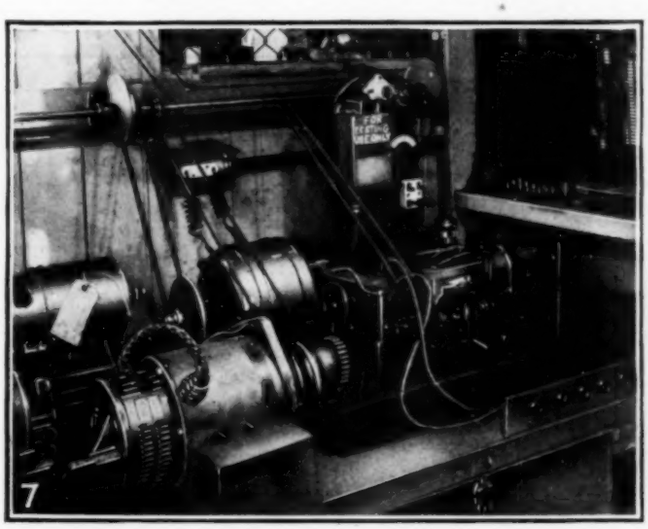


Fig. 7—Testing repaired electric generators. Fig. 8—A corner of the electric repair department

is handled. The work of this department includes the repair and testing of generators and magnetos, switches, wiring, automatic circuit breakers and other parts of the car lighting system, and the care and maintenance of the storage batteries.

All journals are equipped with a standard type of roller bearing, in order to reduce friction losses to a minimum. Fig. 9 shows a pair of wheels that has been removed from one of the trucks of the passenger cars. The housing in the middle of the axle covers the bevel driving-gear by which power is applied to the axle. This device is not in any sense a differential gear, since the axle is a single piece.

A set of wheels from another car is shown in Fig. 10, with the roller bearings and gear housing removed.

Types of Transmissions

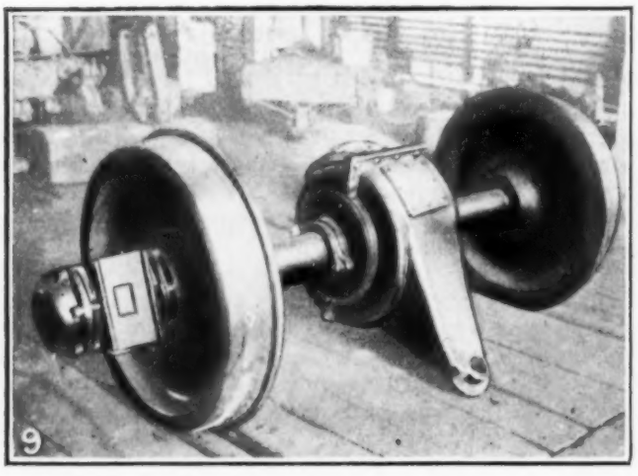
The small track cars are driven by Buda, Fairbanks, Kalamazoo, and other motors, the transmission being in some cases by chain and sprocket directly to the axle of the car, and in others through a friction device that allows a wide range of speeds without positive gradations. In this type, a disk of large diameter is keyed to the end of a short shaft connected to the driving axle by a chain and sprocket. A rubber-faced wheel mounted upon, and splined to, a transverse shaft that is driven directly by the engine, bears against the face of the disk during the time the car is in operation.

By means of suitable levers, the operator of the car brings the rubber-faced wheel in contact with the disk near the periphery of the latter, thus starting the car in motion. The wheel is then moved along its splined shaft toward the center of the large disk, thus reducing the ratio between the driver and driven members and increasing the speed of the car evenly. This device has been applied to the automobile, but without great success. However, it seems to work satisfactorily upon these cars.

Why Air-Cooled Motors Are Used

A track car from which the platform has been removed, may be seen in Fig. 11, fitted with a Buda two-cylinder motor. Air-cooled motors are used on many of the small cars, and for two reasons: Because of their necessarily intermittent service and short runs they are not likely to become overheated, and because the absence of water leaves one thing less to worry about in cold weather.

The Ingersoll-Rand car shown in Fig. 12 is an exception, and the reason is obvious. This piece of equipment is but incidentally an automotive car, its main purpose being to supply compressed air to the pneumatic tools used by the track workers. Though the engine supplies the tractive power to move the car the



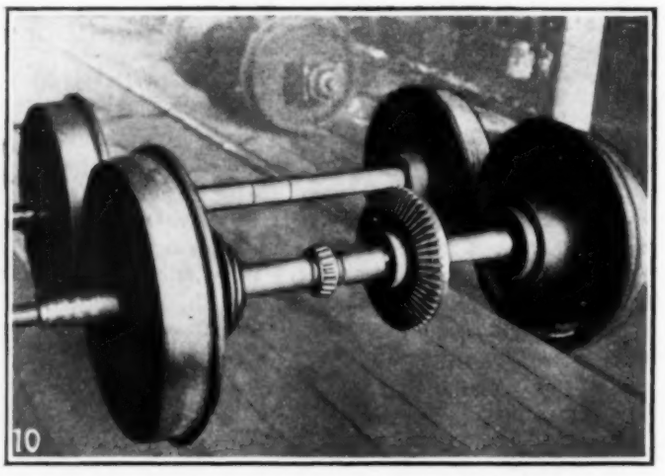
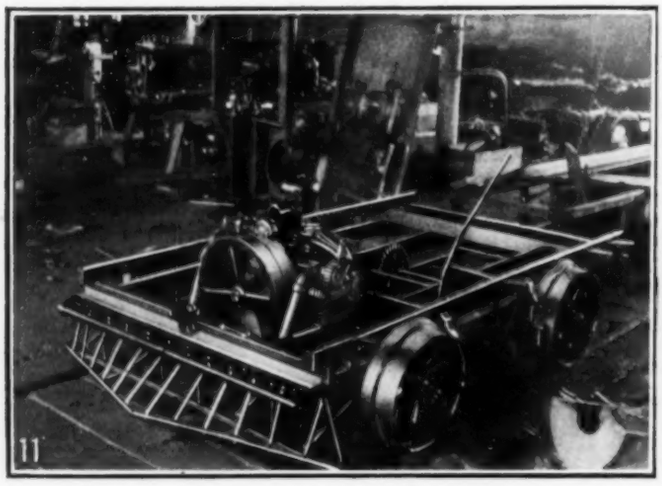


Fig. 9—Pair of driving wheels with gear housing and roller bearings. Fig. 10—A set of wheels for the truck of a gas-rail car



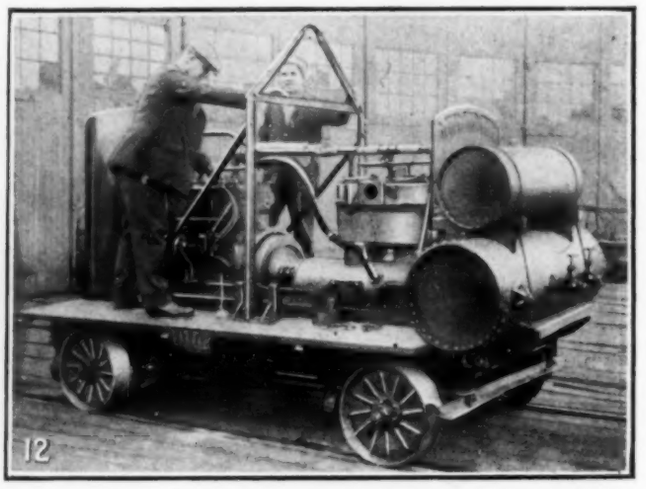


Fig. 11—Track car with a Buda motor. Fig. 12—A mobile air-compressing outfit

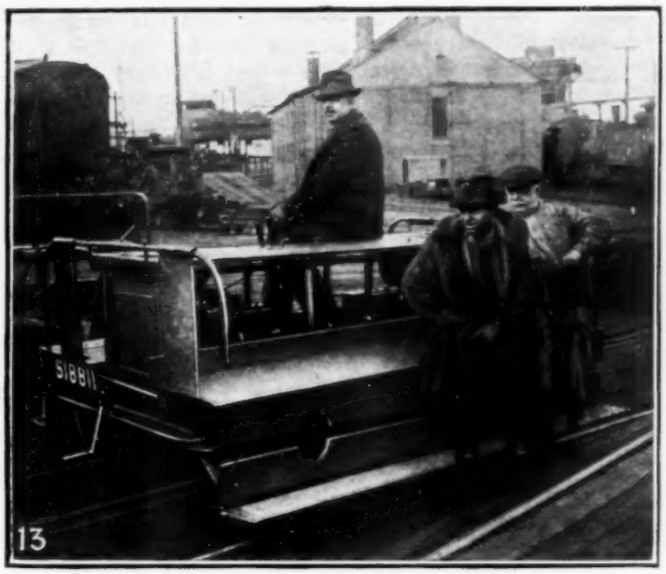


Fig. 13—Track car ready for service.

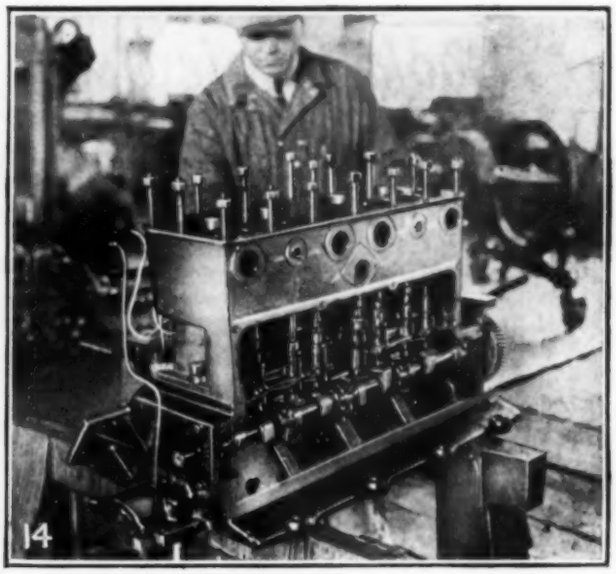


Fig. 14—Repairing a Twin City Motor

greater part of the time the car is standing beside the track with the engine running at full capacity to drive the direct-connected air compressor that forms a part of the unit.

In Fig. 13 may be seen one of the track cars upon which the repairs have just been completed. Fig. 14 represents a different type of engine—a four-cylinder, Twin-City motor that is used to turn a large turntable in the locomotive yards.

(Conclusion)

Standardizing Locomotive Repairs

By C. M. Hillman
Shop Superintendent, The Minneapolis & St. Louis R.R. Co.

THERE are many advantages and some disadvantages in standardizing locomotive repairs. I am of the opinion, however, that the advantages are greater than the disadvantages.

The Minneapolis and St. Louis R.R. Co. standardized on boring valve-chamber bushings some time ago. We have increased the tolerance $\frac{1}{8}$ in. over our old practice. We step the sizes up in sixteenths and this, as a rule, will about clean up the hollows in the bushings. This practice gives us five different sizes before renewal and has also permitted bushings to remain in the chambers longer, resulting in fewer renewals.

Valve bull-rings are built up with manganese bronze by the Oxweld process, and then turned to suit the valve chambers. This method has been very successful and has eliminated to a certain extent, necessary renewals of bull rings due to increased size of chambers. We use only one boring head. The workman is told the size to make the chamber, and he sets the tools in the boring head to the proper size.

We have also standardized crosshead shoes in reference to width and distance from the crosshead seat and the wearing faces. Crosshead shoes are planed in rows, and are interchangeable at all times on the classes of locomotives for which they are intended. We have started a practice of permitting the lower guides to be raised not to exceed $\frac{3}{4}$ in. This is to permit greater wear on the shoes, instead of renewing or applying wearing faces of babbitt or other bearing metal. This practice was started during the early part of 1925. Prior to this time, our practice was to not permit adjustments of guides between shoppings.

The guide width is a standard and not subject to alteration. When guides are worn to exceed $\frac{1}{16}$ in., they are built up to standard with manganese bronze, planed and draw filed, since planing alone does not leave a very smooth finish. Crossheads are drilled in a jig, and bolts are a standard size, so that any crosshead shoe for a certain class of locomotive will fit the crosshead of any of the locomotives in that class.

Spring rigging is standardized and has proved satisfactory. Standard-size bushings and pins are being used. These parts are case-hardened to insure long life.

The development of a standard practice for welding operations is now in process on our railroad, this to cover all methods now in practice so that at all points in the system the same kind of metal will be applied and the methods used will be the same. Standardization will clear up many conditions so that men at one point cannot say "it cannot be done" and at another point will say "it can be done." If one shop can successfully complete certain jobs and another point cannot, there must be some other reason than the method.

The standardization of valve-motion pins and bushings is a good practice. It is possible to complete at least two-thirds of a pin, as well as of the bushings, by permitting the fits to be blank until ready for application to the locomotive.

It is possible to go too far in standardization, since every day brings new ideas, and it may be possible to overlook improvements in order to favor standards. This point is one that must be kept in mind at all times. Some parts can be standardized to an advantage and the trend is in that direction.

Times change and one of the changes is in prices of airplanes being given as "flyaway" Wichita, instead of f.o.b. as of old. It's just a sign that aircraft building is getting to be a real business.

Book Reviews

Foundry Practice. By R. H. Palmer. Four hundred thirty-two pages, 5x8 in., 242 illustrations, cloth-board cover. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $3.

Descriptions of recent improvements in foundry machinery and equipment and labor-saving methods as applied to the foundry, have been included in this volume, which is the third edition. Means of obtaining greater production by modern equipment are shown. Such devices include elevating machinery for supplying sand to the flask, equipment to facilitate the handling and pouring of hand-made molds, devices for shaking out and returning sand and flasks to the machine, continuous molding and pouring systems, gravity devices for handling flasks, and machinery for delivering cores to the molder from the core-room.

Charging the cupola with specially designed buckets, electrically operated, is compared with hand-charging methods. Cleaning castings has been given considerable mention. Tumbling, pickling and sandblasting methods are covered in detail. Moving supplies of the heavier type in and around the foundry, and delivering the foundry product to other departments, are described. Numerous mechanical tables and formulas used in brass-foundry practice have been added.

The contents, dealing with all phases of foundry work, should be of value to the student and the foundryman. The subject is covered with a view of bettering the efficiency of foundry work, enabling a saving in labor, and increasing production per square foot of foundry area.

Year Book, 1926, American Institute of Electrical Engineers. Six hundred six pages, 6x9 in., cloth binding. Published by the American Institute of Electrical Engineers, 33 West 39th St., New York City. Price $2 to non-members.

The volume contains general information on the objects and purposes of the Society, together with the constitution and by-laws. It also gives complete lists of members arranged alphabetically, and by geographic distribution.

Aircraft Instruments. By Messrs. Eaton, Beij, Brombacher, Frymayer, Henrickson, Seward and Strather. Two hundred sixty-nine pages, 5¾x8¾ in., board covers. Illustrated. Published by the Ronald Press Co., New York City. Price $5.

The authors are all connected with the Aeronautic Instrument Section of the U. S. Bureau of Standards, which gives them an opportunity to become familiar with the theoretical side of instruments, and the volume is, quite naturally, written from this viewpoint. This is particularly noticeable in the reference to the earth inductor compass.

The theory of the various instruments is given, and, in most cases, the commercial developments along the various lines, also, showing more evidence of commercial progress in aviation than the public is apt to realize. The volume is liberally illustrated with diagrams of mechanisms and with half tones of commercial instruments of various types. Unless one has kept pace with aircraft development, he is sure to be surprised at the number of instruments already in use, and the way in which they function. One is apt to forget that the aviator above a cloud or fog can have no sense of direction, nor does he know whether he is flying level or straight. He must depend on instruments for this knowledge in addition to instruments of navigation similar to those used at sea.

All who are interested in either aircraft development or in studying instrument design will find the volume of value.

Fresh Air and Ventilation. By Prof. C.-E. A. Winslow. One hundred eighty-two pages, 5x7½ in. Published by E. P. Dutton & Co., 681 Fifth Ave., New York. Price $2.

The author of this book is Professor of Public Health at the Yale School of Medicine, and is Chairman of the New York State Commission on Ventilation. In this volume Professor Winslow attacks the subject of ventilation in a practical manner, giving for the first time in an easily readable form the results of exhaustive experiments which have previously only appeared in highly technical reports.

The author explodes some common fallacies relating to fresh air, and shows the various relations of temperature, humidity, and purity of the air to the health and efficiency of workers. The profound effects on health from bad ventilation is shown, and the author illustrates clearly that ventilation does not mean simply the opening of windows. The depressing effects and the decreased productive efficiency due to odors and smells is also treated. The effects of carbon dioxide and monoxide, grinding dusts, and other impurities in the atmosphere of factories is illustrated by interesting examples. The book should prove valuable to managers, foremen, and others who are interested in the health and efficiency of their employees.

Reduction in Prices Through the Elimination of Industrial Waste. By Herbert Hoover. Published by the Department of Commerce, Washington, D. C. This phamphlet is an extract from the Thirteenth Annual Report of the Secretary of Commerce. Statistics show that although wages have risen since 1921, prices have dropped, a situation that is accounted for by the nation-wide progress made in the elimination of waste. Detailed reports by the various division heads of the Department are given. The reports include the elimination of waste in railway transportation, general processes, construction, distribution, business documentation, and fisheries. Improvements in inland waterways, highway safety and the savings due to wider electrification are also amplified in turn. The progress depicted is most encouraging.

Trade Standards. Adopted by the Compressed Air Society, 90 West St., New York, N. Y. Second edition, forty-eight 6x9-in. pages. This pamphlet embodies the result of extended study and research on the part of engineers and executives associated with the Society. It embraces the nomenclature of air compressors and their operation; a history of the development of speeds of air compressors; considerable data on capacities, pressures and power; instruction on the installation and care, lubrication and cleaning of compressors; low pressure nozzle test code; and a list of applications of compressed air.

Economy in Press Tool Design

By W. E. Irish
Associate Editor, *American Machinist*

Combining operations to cut handling costs without endangering production—Applying standardized unit design—Details of construction on the type-bar and key-lever tools

QUANTITIES involved in making typewriter parts are large while the pieces themselves are relatively small, a pair of facts that are both advantageous, and a danger, in the design of press tools for the work.

Quantity runs of 10,000 or more parts, and succeeding runs without change of design, render the first cost of the press tool proportionally negligible. The small size of each part makes it possible to combine operations. These are the principal advantages.

Should the tool fail in the course of a run for any reason, however, and provision not be made for quick repair the cost of part manufacture will be seriously affected. This point becomes increasingly dangerous as operations are combined and correct design is more and more of importance. There is a certain line that must be approached but not passed where there is a balance between cost of manufacture due to handling between operations and cost of shutdown for repairs.

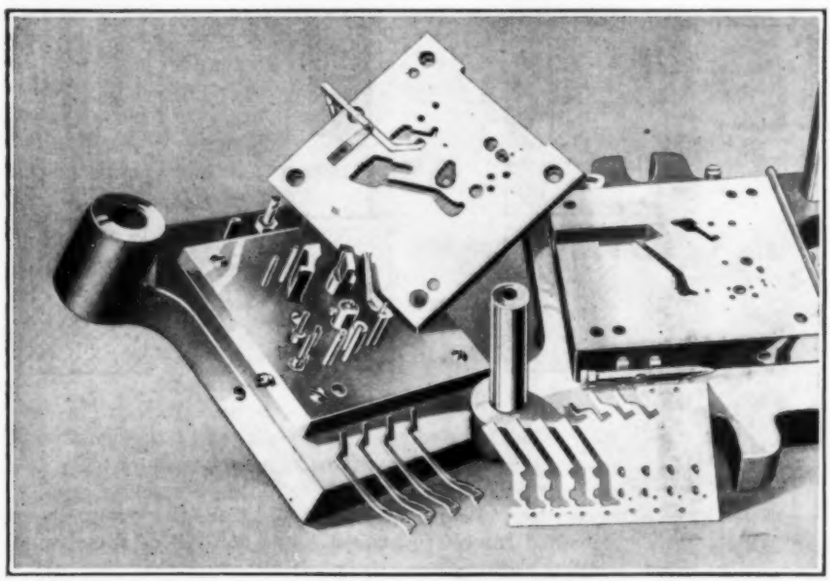


Fig. 1—The five-operation type-bar tool

At the Corona Typewriter Co. plant the problem has been studied through a long period of experiment and resulting experience. The tools to be described here in detail show what that company has done to strike a close balance, and since one part is as good as another to start with, the same principles of design having been applied to each we shall consider the type bar first.

In Fig. 1 is a photograph of the tool with the stripper plate removed from the die. Several finished parts are also shown, together with a piece of the strip scrap. In Fig. 2 is a detail drawing of the part. There are a number of operations combined in this tool, perforating, countersinking, numbering, forming and blanking; all in fact that are required to complete the part from the blank strip. There is therefore but one handling.

Let us see what has been done in the details of design to insure dependable continuous operation. As indicated in Fig. 2, there are two holes *A* and *B* to be perforated. The hole *A* is also to be countersunk on both sides. The blanking work is self evident with the added provision that the perforations *A* and *B*, the projections *C* and *D* and the edges *E* must be in exact relation to each other. The forming consists in bending the part at *F* to each of the angles indicated for a run of a certain bar. The number which is stamped in at *G* identifies the bar from other runs of a different bend angle. There are a total of 42 bend angles to make up one set of bars for each typewriter.

The result of the first five hits on a new piece of strip stock are shown in Fig. 3, the heavy lines indicating the progress of the work on each succeeding hit. It should be borne in mind that the order shown is opposite to that which actually occurs when the strip is advanced.

On the first hit, perforations *A* and *B*, with two others to produce the projections *C* and *D* and the notch *E* are put in the strip. At the same time, two additional holes *X* and *Y* are put in to serve as guide-pin holes for succeeding hits.

The next hit adds a second notch *E* to complete the type end of the first bar, and to start the front edge of the second, while the second set of perforations *A*, *B*, *C*, *D*, *X* and *Y* are made. On this hit, guide pins in the punch register in the first holes perforated at *X* and *Y* to locate the strip accurately.

On the third hit, the lower side of perforation *A* is countersunk, or better, pointed as the press operation is called. The effect is the same as countersinking, the square edge being broken down to a slight bevel.

The fourth serves to point the upper side of perforation *A* and to stamp the number at *G*. The bending

The second of a series of articles on press tool design for typewriter manufacture. The third will appear in an early issue.

operation is performed along the line *F* at the same time.

In the fifth position, the first complete part is produced when the blanking punch shears the remaining connection between the part and the strip. The part is removed down through the die. After these first five hits, one piece will be produced on each revolution of the press crank which occurs at the rate of about 70 strokes per minute. The stock is shown sheared on the left-hand end at 18 deg. from square for purposes of starting the strip into the die without interference, as will be explained later.

Naturally, the tool to do this work required careful design and it will be seen by studying the next few diagrams that very little is left to be desired in this respect. The die is shown in Fig. 4 with the stripper plate removed.

The die block as, in fact, all of the other tool-steel parts, with the exception of the wire punches, are made of Ketos oil-hardening steel. This is true for all of the tools to be described. To assist in explanation the same letters are used for identification, as are shown in the strip diagram.

It is the company's policy to use inserts at all points where service is severe or where replacement is liable to be required. Referring to Fig. 4 inserts are therefore used for the group of perforations *A*, *B*, *C*, *D*, *E*, *X*, *Y* and at *H* where the lower pointing punch for perforation *A* is located. In addition, the group insert is bushed for perforations *A* and *B*. All of the circular bushings are pinned in position after they are set to register accurately with their punches. This construction conforms with the Company's standardized design previously described on page 619, Vol. 4, of the *American Machinist*.

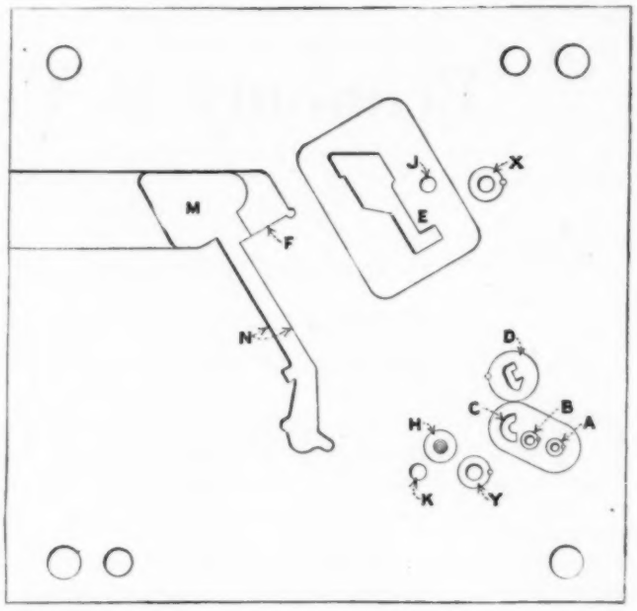


Fig. 4—The die with the stripper plate removed

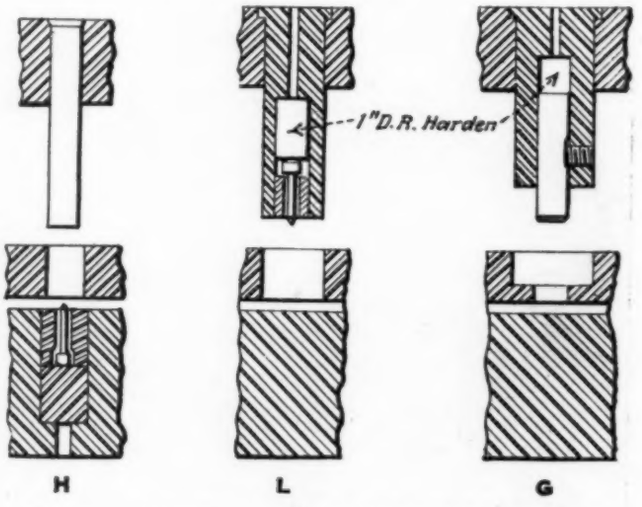


Fig. 5—Detailed assembly sections at the pointing and numbering punches

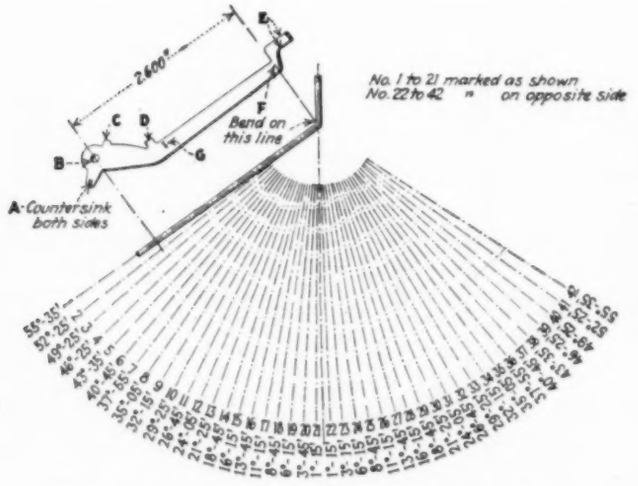


Fig. 2—The type bar and its 42 final shapes

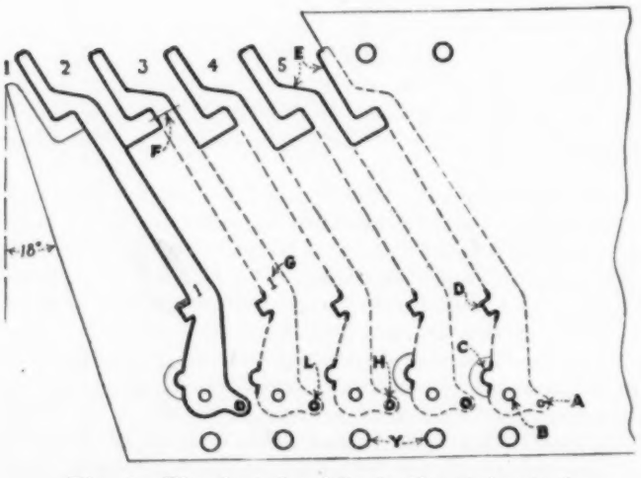


Fig. 3—The first five bits in the strip stock

The clearance holes *J* and *K* for the stock guide pins are not bushed since, regularly, the guiding point is in the stripper plate. They are made to cut, however, if by accident the guide pins should descend on stock not previously perforated and are also cleared through the bottom of the die block. They are made to a clearance of one-half the stock thickness as shown on the standardization sheet just mentioned.

The construction of the pointing-punch assembly located at *H* in the die is shown at *H* in Fig. 5. The punch is allowed a slight lateral float so it can center itself without side strain.

The edge *F* of a cutout in the die block, Fig. 4, serves as the locating edge over which the end of the bar is bent to the required form. This cutout goes

completely through the die block and shoe at *M* and forms a continuation of the final blanking edges. The cutout which started at *F* is extended out to the left-hand edge of the die block at a sufficient depth to allow the strip to be removed when the last possible part is made as indicated in Fig. 1 on the piece of stock illustrated.

This is necessary since there will be one type end formed down when the last part is blanked. The stock cannot, therefore, be pulled from the end at which it was entered. While it would be possible to get a few more parts from each strip, this is not attempted due to the danger of tool breakage and the comparatively small value of the pieces sacrificed. The strip is stopped when the last hit has been made in which every punch in the assembly can hit solid stock.

A bottom view of the assembled punch is shown in Fig. 6 and is lettered to correspond with the other figures. In this view the pointing punch *L* for the upper side of perforation *A* and the numbering punch *G* are shown. Both can also be seen in Fig. 5 at *L* and *G* respectively.

Due to the shape of the part in the strip and the gaging requirements it is impossible to clear the stock with both of the guide pins upon the first hit in a new strip. Guide pin *J* is, therefore, made of the disappearing design that has been standardized and is shown in Fig. 6 backed up by the locking slide *O*. The punch *F* and spring plunger *P* are used to perform the bending operation on the hit just prior to final blanking. They are also shown in section at *F* and *P* in Fig. 7. The screw and plunger *Q*, Fig. 6, are used to set pin *F* at the proper point for a given angle and to change the angle for changing type-bar numbers. The plunger *P* holds the work down on the die. The bending action is self evident.

In order to eliminate any chance of the blanks sticking to punches *E* and *N* they are provided with stripper pins, one in the former and two in the latter. These pins protrude somewhat beyond the end of the punches and are backed up by springs in the body of the punch above the punch plate.

In addition to the sectional view of the forming punch *F*, and the spring pin *P*, shown in Fig. 7, this view also shows a section taken through the three perforating punches *A*, *B* and *C*. The two former are made replaceable without dismantling the punch plate due to the danger of their breaking. In the design shown very little time is required to make the change

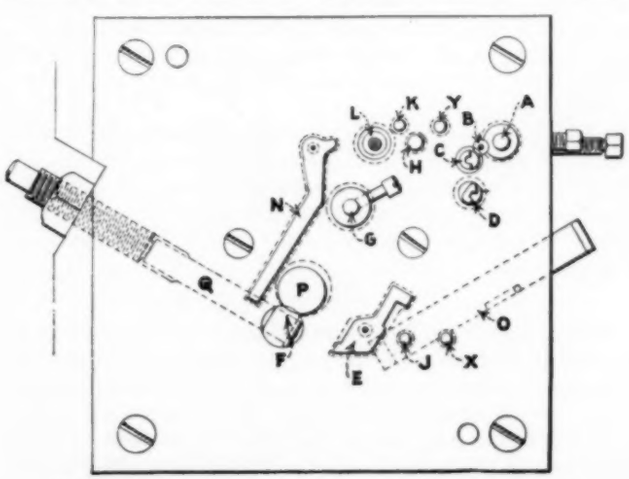


Fig. 6—Bottom view of the assembled punch

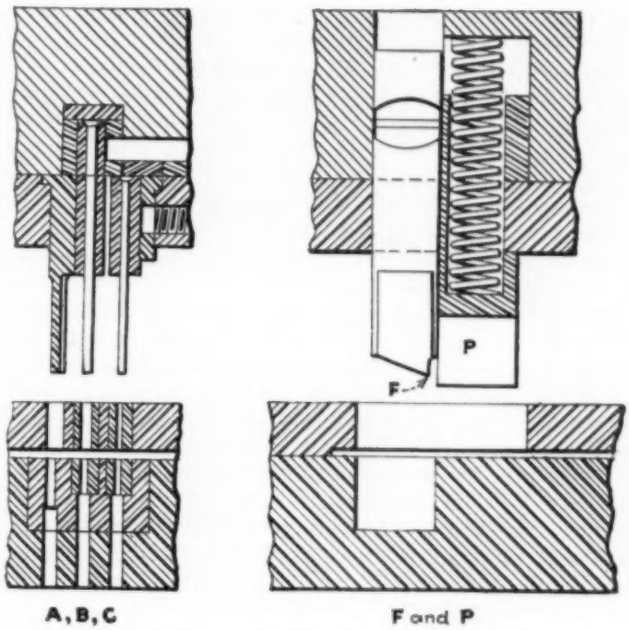


Fig. 7—Detailed assembly sections at the forming and perforating punches

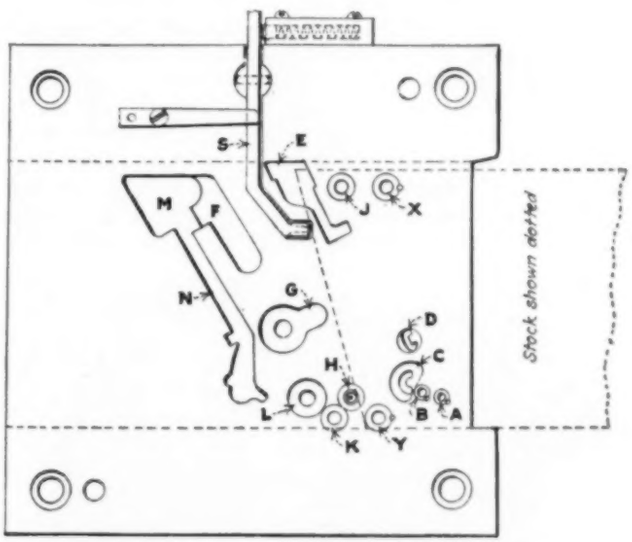


Fig. 8—The stripper plate and work stop

and set a new punch, a supply of which are held in a small cylinder attached to each perforating tool in a convenient location.

In Fig. 1 this cylinder can be seen in its holders on the die block just in front of the die steel. This furnishing of spare punches with the tool is just one of the many little items that go toward insuring a minimum of piece production cost.

To make the description of this tool complete, the stripper plate, and the work stop *S*, in place, are shown in Fig. 8. The construction requires no particular description as the same system of lettering is again used. The stock stop is special as to shape but its design and action are identical with the standard described in the article previously mentioned on standardization. The gage is tripped on each hit by a finger on the punch which depresses the outer end and lifts the gaging point free of the stock so it can move forward, due to the spring behind it, and return as the

ram rises to land on top of the strip, thus leaving the strip free to be advanced one step.

The strip stock is sheared to its 18-deg. angle from square as indicated in dotted lines. By shearing to this angle, the correct stopping edge is provided for the first hit, and the end of the strip is made to clear the guide pin *K* so it need not be made of the disappearing type as is necessary for pin *J*. The stripper plate is counterbored at *C*, *D* and *G* in order to clear the punch sleeves at those three points. The tool is an excellent example of combined-operation design.

Another multiple-operation blanking tool is illustrated in Fig. 9. A piece of the scrap stock is shown with it. This tool is used for blanking the part known as the key lever. As can be seen in the part detail, Fig. 10, the outline is an intricate one. It is essential that the small perforations be in exact relation to each other and they are, therefore, perforated in the strip before the part is blanked out. In this tool, it is equally essential that the final blanking punch be made without any more intricate outlines than is necessary. There are, therefore, a number of preliminary perforations put in the strip stock to gain this point.

A top view of the die is shown in Fig. 11 with the stripper plate cut away except for that portion which carries the work stop. The strip stock is shown in dotted lines with its end edge *A* located against the stop for the first hit. At *B* is indicated the edge to which the stock is registered against the stop for the succeeding hits.

Guide pins to register the strip exactly on each advance are located at *C* and *D* and, of necessity, are of the disappearing design for the first hit. They are backed up by a slide in the punch plate which can be pulled out to release them according to standard design. Punches at *E* and *F* are set to perforate the guide pin

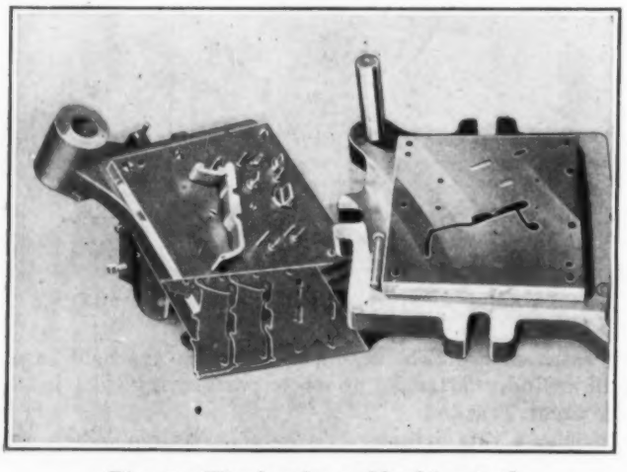


Fig. 9—The key-lever blanking tool

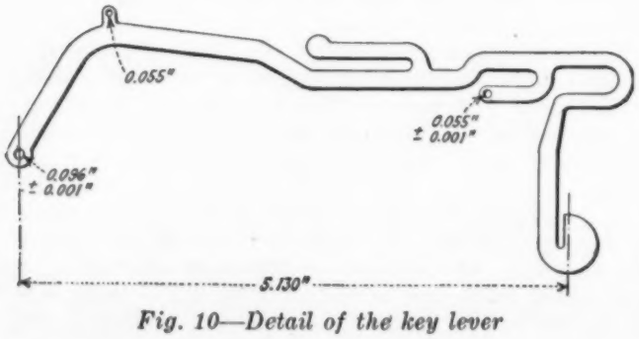


Fig. 10—Detail of the key lever

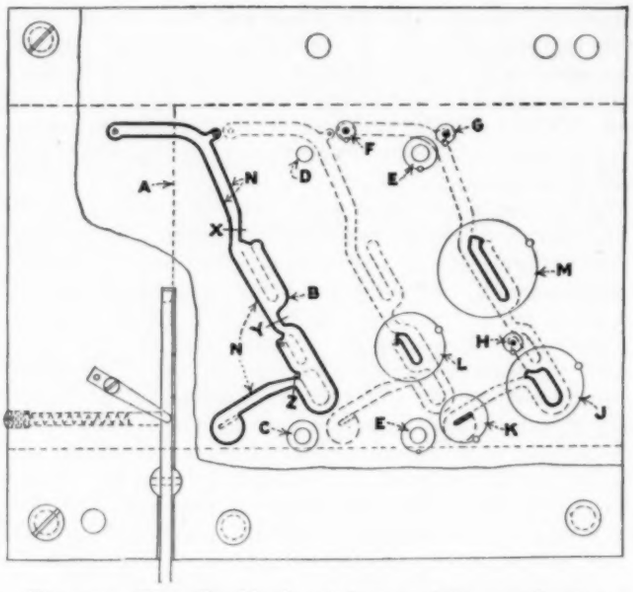


Fig. 11—The die block, stripper plate, work stop and the work in progressive positions

holes, while other punches at *F*, *G*, and *H* perforate the holes that are called for in the part. Again, in accordance with standard design, the dies for these perforations are inserts in the die steel proper.

Finally, to accomplish the desired result of making as simple an outline for the final blanking as possible, the strip stock is perforated as shown at *J*, *K*, *L* and *M*. In each case there are a number of complications removed from the contour of the final punch and die outline, which is shown at *N* in solid lines. The punch, itself, is further simplified by dividing it into four parts, which join at points *X*, *Y* and *Z*, indicated, at the part-blanking position, by lines across the die in the illustration.

The relative position of the parts produced in the first three hits are shown in dotted lines to illustrate the progressive action. The first part will, of course, be incomplete by the amount that the blanking punch projects to the left of the strip end at *A*. The second hit will also be incomplete due to lacking the perforations *F*, *G*, *H*, *J*, *K* and *M*. The third hit, and each succeeding one, will result in a complete blank.

At first glance, it would appear possible to design the tool to make the second hit a complete one by moving the punch and die positions, just named, one step to the left. This, however, was considered unwise from the standpoint of complicating construction and of endangering continuous production by a greater possibility of failure.

It is the company's policy to use the multiple operation tools wherever it is possible, but to work into their design a sufficient amount of simplicity even at the cost of a few extra hits and a little lost stock to safeguard against breakdown and to insure profitable production at a low cost.

There's one thing that every shop can learn from the articles on automobile building and that is the necessity of locating points to position work for different operations. Sometimes we can use the first surface we machine, but many times it is better to drill special holes or mill special pads for locating points. When you want duplicate work, don't forget the locating points.

The Man in the Shop and Mathematics—Discussion

By R. B. Willis

ON PAGE 8, Vol. 64, of the *American Machinist*, Harold R. Goodrich, in an article under the title given above, does a good deal towards clearing away some of the mystery surrounding plane trigonometry. It seems to me, however, that the matter still remains one about which much truth can be told to the man in the shop.

I have found that words, no matter how carefully selected, are of little use without a picture. The picture in this case must of course be a diagram. Fig. 1 shows a diagram that has been used many times to explain what is meant by the sine, the tangent and the secant of an angle.

The student learns that *AC* is the sine of angle *COA*, that *BD* is the tangent of *DOB*, and that *BO* is the secant. What good will it do the man in the shop to know that *AC* is the sine of the angle, or that some other line is the tangent? The shop man wants to know what line divided by what other line equals the number, or decimal, in the table of natural functions for the particular angle and function he is dealing with.

It is perfectly plain to me when I read that the sine of the angle is the quotient obtained by dividing the length of the side opposite the angle by the length of the hypotenuse. But I believe that the reason it is clear is because I happened to be "brought up" on the diagram shown in Fig. 2. This is the figure used in

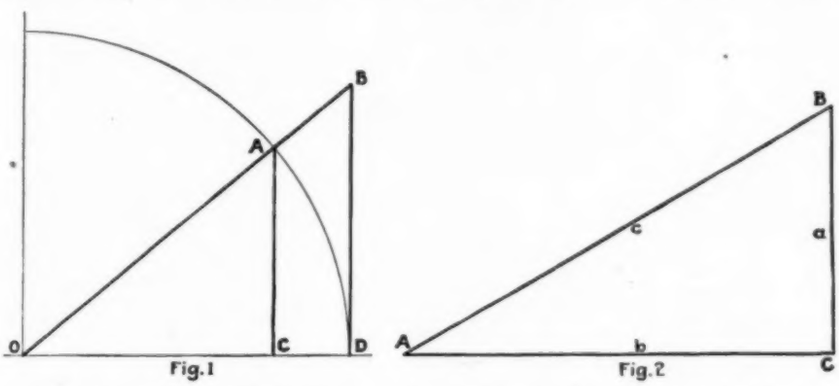


Fig. 1—The usual diagram. Fig. 2—A simpler one for deriving angular functions

Wentworth's *Plane Trigonometry* many years ago.

And all that is indeed to explain the figure is this:

a/c	equals	Sin A		a	equals	c Sin A
b/c	"	Cos A		b	"	c Cos A
a/b	"	Tan A		a	"	b Tan A
b/a	"	Cot A		b	"	a Cot A
c/b	"	Sec A		c	"	b Sec A
c/a	"	Cosec A		c	"	a Cosec A

If the student learns the first column without trying to understand just why the statements are true, he will soon come to realize that the tangent, for instance, is not simply a line, but for his purpose it is the relation between two lines, whether a circular arc touches the line, or not. That relation he finds in the table of natural functions. If he seeks an angle, knowing two lines, he finds the ratio by dividing one by the other, and then looks up the angle in the table.

A good table that shows the functions for each minute will do much to give the man in the shop confidence in his ability to use trigonometry. I think too many tables have been put into the machinist's hands that worked against him because the tables showed the functions only for each ten minutes. It is out of the question to work to the thousandth of an inch without a table that goes down to minutes. I have even had occasion to interpolate between minutes for shop work. The mechanic will finally be able to interpolate intelligently, but not until he realizes the way each function is changing.

More Interest in Apprentice Training

THERE is a revival of interest in apprentice training. And there also seems to be a feeling that part of the job at least can be handled by the public schools—not with the idea of the school teaching the trade and turning out a journeyman mechanic, but either to give a foundation, in the shape of a general knowledge of machines, or to supplement the trade training of the shop with mathematics, mechanical laws and useful facts. It is believed also by many to be a good opportunity to plant a few ideas as to civic duty and everyday economics.

With a view of getting a general idea as to what is being done by the schools along this line, we have secured data from thirty-five cities in the U. S. A. from Boston to Seattle, and find that, with few exceptions, some work is being done along the line of either Trade Schools or the training of apprentices. Sixteen of the thirty-five cities either have classes for apprentices, mostly during the day and with pay by their employers, or have plans for teaching in the near future.

Nine of the thirty-five cities have trade schools, four of the same cities also being engaged in apprentice training as well. Four of the cities maintain part time or cooperative classes, all of them having either trade schools or apprentice training, and two cities, Boston and Pittsburgh, have all three.

Apprentices in Wisconsin are under state supervision, the agreement with the employers being that the boys shall be taught the shop processes necessary for them to become journeymen. They are to attend the vocational school for 400 hours during the first two-and-one-half years, though some attend during the whole period. The school session is one-half day, or four hours per week. The boys, of course, receive pay for their school time.

Pittsburgh gives training in either day or evening classes to 471 apprentices, but none of them are in the machine building trades. It also has about fifty half-time students in some trades.

A very encouraging report comes from Dubuque, Iowa, where a class started last September with nine boys, has grown to fifty-two, including nearly every machinist apprentice in the city. The average attendance of over ninety per cent speaks volumes for the interesting nature of the classes.

esting. Classes in foreman training have also been conducted in five plants in that city.

Evening classes are reported in several cities, at which machinist apprentices attend quite regularly, showing that there is still a real interest in the trade on the part of at least some of the boys of the country. Several states make attendance at continuation or vocational schools compulsory. In addition, they usually provide for voluntary attendance at evening classes. One city reports that, owing to lack of interest in apprentice training, it has closed its school after operating it for a number of years. In view of the growth of the idea in other sections, this result would seem to be due either to unusual business conditions, or to a failure to make the need for the school appreciated, and the instruction of interest to the boys.

Conveniences of Some Old Machines

By A. W. Forbes

A salesman was explaining the merits of a modern up-to-date drill press, when one of my younger mechanics looked over his illustrations and remarked, "It isn't as good as that one." He pointed to one out in the shop. It was of the same make, but of about the same age as the mechanic. The bearings were worn out and the table was badly damaged.

The new machine was more rigid, far more accurate, and would drill six times as fast as the old one ever did. It looked to me like a far better piece of workmanship. So my curiosity was aroused, and after the salesman left we discussed the relative advantages of the two, and also compared them with the advertisements in the *American Machinist*.

It seemed true that most of the modern drill presses had lost something of the flexibility and ease of adjustment of the old machines. To be specific, the tables were so heavy that they could not easily be lifted to position by hand. Screws were therefore, provided, which made the raising of the tables much slower than the old way of simply lifting them.

The tables on the new machines were fixed central with the drill spindle, while the tables on the old machines could swing.

The old machines had a V and a cup for holding the ends of round shafts on the side, in line with the drill. With the new machines it was necessary to line them up on the flat table.

The tables of the old drills could be removed in ten seconds, for tall objects that must be stood on the floor. To remove the table of the new drills is a long job.

There may be modern drilling machines that are as adaptable as this old one, but I did not see an advertisement of one in the particular issue. The old machine was of the common type in its day, but I do not know where I could buy one now, with one table that swings, and another that slides up and down, but which can be lifted off and other types of holders put in its place. I have not seen anything more flexible since that design.

In the effort to secure greater speed of production, greater rigidity, etc., qualities of flexibility have been neglected by many designers. The man who is to use the machine may be more interested in certain features of flexibility than he is in the speed of cutting. He may also spend more extra time in setting up the machine than he saves by speed on the actual operation.

The Latest Metric Bill

By Donald A. Hampson

If anyone in the machine business can use the metric system to advantage, it is the writer's opinion that he should be perfectly free to do so. Also, he holds the opinion that no one should force it down the throats of those who cannot well make the change. As the cost to the country would probably run fully as high as that of the World War, should we have a compulsory bill passed, and as the machine business would be the greatest sufferer, it is certainly incumbent on those in that business to present certain facts of which the lay public knows nothing.

First, there is the argument of simplification. Contrary to the metric enthusiasts, you don't interchange pounds with quarts and feet and you neither buy nor measure these in the same breath. What is worst about the proposed system is the substitution of meaningless four-syllable words for short one-syllable words that two-year-olds can master successfully. Think of the time wasted every hour in that unnecessary effort!

Second, the confusion "that now exists" does not exist at all. The coal man deals in tons, exclusively. That is a most convenient unit of weight and of measure—neither he nor his customers care anything about grams or ounces or pounds. The machinist weighs everything in pounds and simple fractions thereof and he measures in inches or feet according to the kind of work he is doing. For close work he goes to convenient fractions while for still closer he goes to thousandths. His choice of measurements does not interest the carpenter, who likewise has standardized upon those most convenient for him.

Thus it is that each line is working out its own salvation, and all of it reacts to the benefit of mankind. Engineering societies and trade associations are largely responsible for the present condition. Actually, the benefits that the metric party would shower upon us have been discounted twice over by the standardization and elimination which these bodies of experienced men have accomplished in fields that *they* know all about.

An outstanding case is that of the automobile. Never have the manufacturers offered cars so cheap and so good as at the present time. All measurements in car building are in inches—no one ever heard of any other, there is no need for any other—beside this achievement toward universal use and simplification, the metric system must silent remain. The single fly in the ointment is that of bearings, for the early ones were of foreign make and for the sake of easy replacement no one has dared to change the one freak dimension of bearings to English units—here is a bad blow, incidentally, to those who proclaim the ease of changing to other units.

But the most overdrawn picture is that of arithmetic. Let no one think that we will have a Utopia wherein all calculations resolve themselves into the mere shifting of a decimal point. The decimal system is centuries older than the metric and it is in widespread use for accurate manufacturing, yet every engineer and every machinist knows that not one calculation in a hundred can be solved as easily as that. We will always have to add and subtract (no help from the decimal point there), the circumference of a circle will remain 3.14 times its diameter, and the formulas for bending moments and column loads will require manipulation of the same awkward constants as before.

Automotive Production

Cylinder Heads of the New Stutz "Eight"

Special milling and drilling methods in machining cylinder heads of a universal design, at low cost—Double-purpose fixtures for milling

By Fred H. Colvin
Editor, *American Machinist*

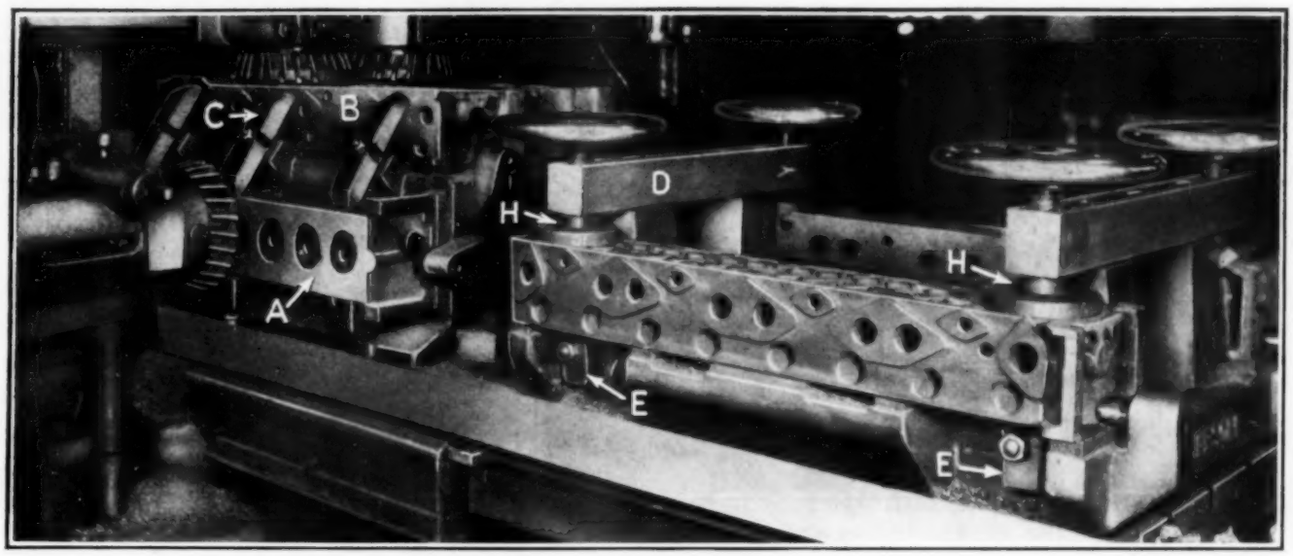


Fig. 1—Single and double deck fixtures

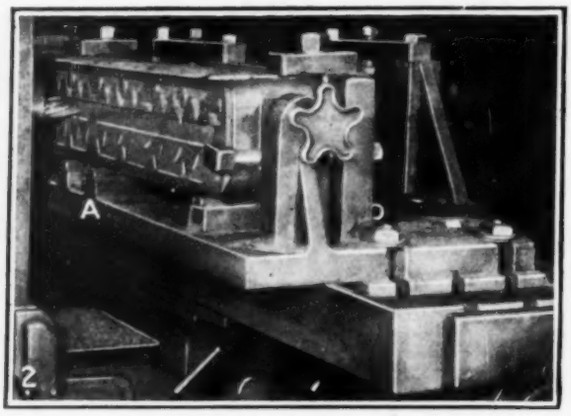
HAVING valves in the head and an overhead cam shaft, makes the design of the Stutz cylinder head somewhat unusual, and presents machining problems not found in the head of the average engine. Not only are the valve seats and the manifold outlets in the head, but also the combustion chambers, which have spark plug holes leading into them on an angle.

The outside of the head has a spray coat of primer and is then milled. Two types of milling fixtures are used on the same machine, as in Fig. 1. The bottom of one head, or the part that goes next to the cylinder, is milled at *A*, while the top of another head is being milled at *B*. The design of the fixture is rather unusual, since it allows both the horizontal and vertical milling spindles to be used on separate faces of two heads, both of which are held in position by a single set of clamps, as at *C*. The clamps are slotted for easy removal.

After the joint face of the head has been rough milled, as shown in the double fixture, it is placed in the single-deck fixture at *D* and the sides milled by the same cutters as machine the bottom at *A*. The fixture is double, and one side of each of two heads is milled at one pass. The heads are held against the sides of the fixture by clamps *E*, and down, on the surface already machined, by the large pads *H*. When all four faces of the head have been machined, the head goes back on the other side of the first fixture and gets a finishing cut on the joint side, to take out any slight warping or inequality that may have developed from removing the skin from the metal. The combination fixtures make it easy to do both rough and finish milling at the same time. The total milling time for both operations is 19.86 min. per head.

The combination fixture shown in Fig. 2, is used for milling the oil valley or channel on top of the cylinder head, to carry the oil back to the ends and down into the crankcase. The machine is a Milwaukee miller and the end mill is 1½ in. in diameter. The second operation in this fixture is shown in Fig. 3. Here the cylinder

Automotive Production



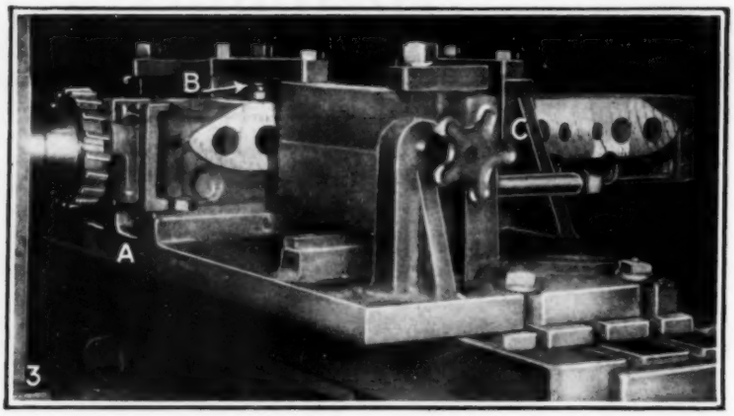
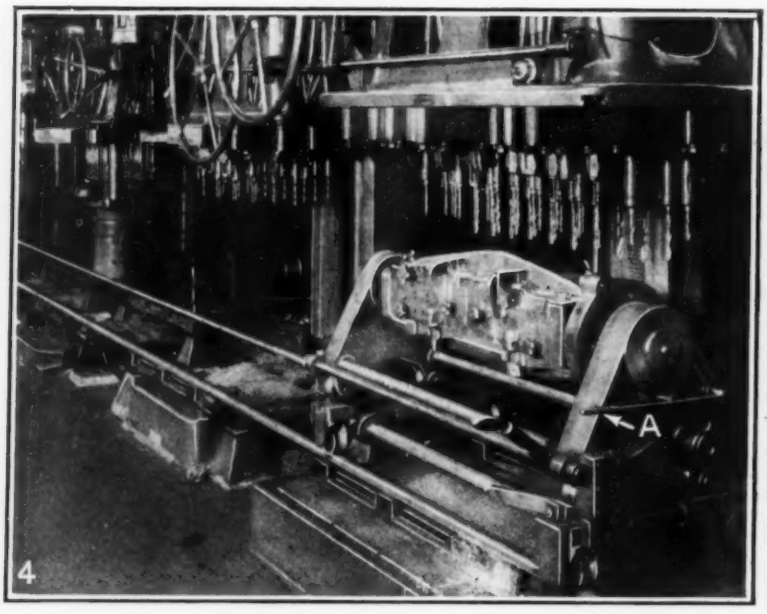


Fig. 2—Milling oil channel in head. Fig. 3—Second operation in same fixture



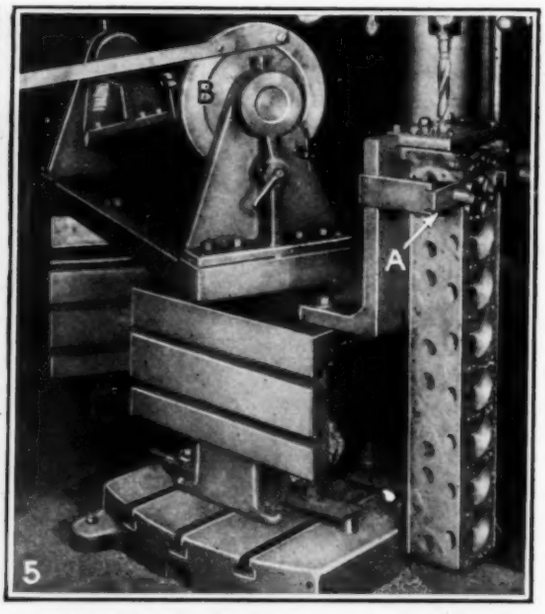
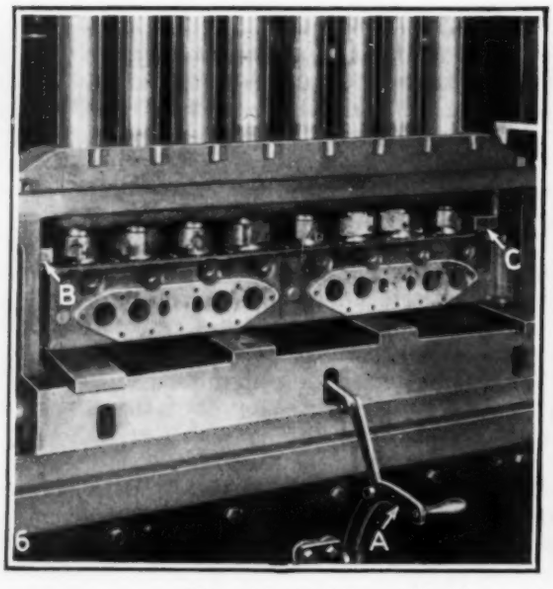


Fig. 4—The drilling line for heads. Fig. 5—Separate drilling operations



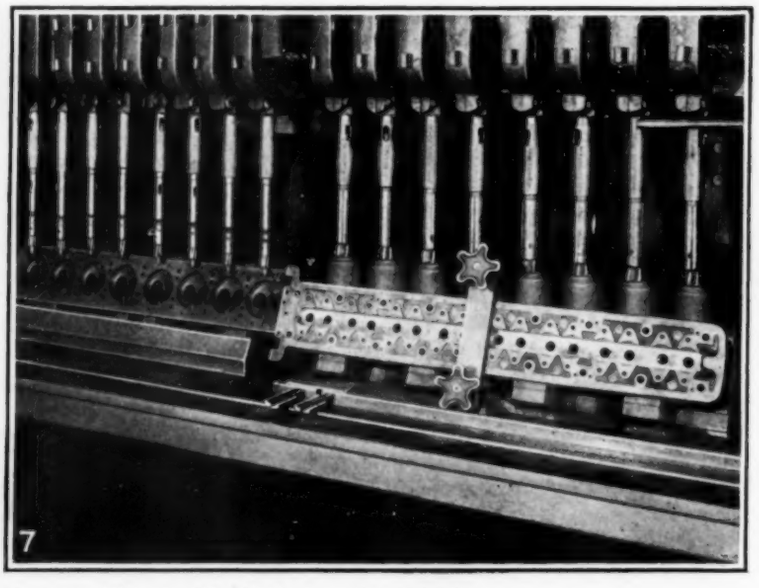


Fig. 6—Boring combustion chambers. Fig. 7—Machining spark plug holes

Automotive Production

head is turned at right angles so as to finish the ends with the face mill shown. The head is located at the front end by the strips *A* and the screw *B*, while the brackets at *C* hold it against side movement. The fixture does not move, the head being shifted for milling the opposite end. While this method would not be advocated for a large output, it handles the work very nicely at present and is suggestive of various combinations for other operations in any kind of a shop. Both of these operations take 26.42 min. per head.

The drilling line-up is similar to that for the cylinder block and is shown in Fig. 4. Trunnion jigs are used, mounted on wheels to allow both cross and longitudinal movements. The indexing lever is at *A* and the index holes are far enough from the center to allow the index pin to hold against any movement. As with the cylinder blocks, there is a radial drilling machine at the end of the line to handle oddly-placed holes.

One of the operations on the radial is shown in Fig. 5, where the ends are being drilled in the angle-plate jig, bolted to the table. The head is quickly set and held by the clamps *A*. The time on this operation is 14.27 min. Another drilling operation is done on the trunnion fixture at *B*, in which some of the angular holes are drilled.

The amount of compression in the engine is controlled by machining the combustion chambers to the desired size and depth in the Moline, 8-spindle boring machine, Fig. 6. The boring bars are guided just above the cutter heads to insure proper location and prevent spring. The combustion chambers are held within a close tolerance. The lever *A* controls the clamps *B* and *C*. This operation takes 8.37 minutes.

Another Moline machine with 16 spindles, bores and counterbores the spark plug holes as in Fig. 7. The head is clamped at the proper angle in both fixtures, the one at the right being for boring the spark plug holes, the bars being guided in the substantial bushings shown. Since there are two sets of spark plugs, at opposite sides of the combustion chamber, the head is simply reversed in the fixture. The time is 24.97 minutes.

The holes are counterbored from the inside in the fixture at the left. The bars have pilots on the ends that enter the holes, to prevent spring when cutting on the angular surfaces of the combustion chamber. The holes at the lower side of the head have just been machined, after which the head will be reversed, as for the boring operation. These two simple fixtures and the machine shown handle the rather awkward job without difficulty.

The head is also tapped for spark plugs, counterbored for valve guides, drilled for manifold studs and undergoes several other minor operations before it is ready for assembly.

The growing use of metal in airplane construction promises to open up new fields for tubing, for machines to shape metal into struts and beams, for welding apparatus, and for other details that will all add greatly to the number of machines needed. This is one of the new fields that will make up a large total in machine requirements.

Abstracts

from other publications

Airplane Engine Maintenance

Air-cooled airplane engines have the advantage in maintenance practice over the conventional water-cooled type. First, repairs are obviously unnecessary on the water-system; secondly, maintenance is simplified by the accessibility of the radial cylinders which permits the removal and replacement of cylinders and the grinding of valves with the minimum of work and without removing the engine from the airplane. This last feature is worthy of careful consideration as it will permit most of the overhauling to be done "piece-meal" between flights and allows the elimination of a spare engine which would otherwise be used for substitution during overhauling.

In operations where the volume of work permits efficient utilization of labor, the time for complete overhauling might be estimated as low as 100 man-hours. For small scale operations these figures might be increased to 125 or even 150 man-hours. Estimates of the cost of parts to be replaced show that the average cost of parts replaced during the life of an engine would vary between $2.40 to $3.60 per hour of use, or, in general, the charges might be expected to range between 5 and 7 per cent of the initial cost of the engine for each 100 hours of use. Archibald Black in *Automotive Industries*, March 25, p. 528.

Patent Pooling

History is given of the patent pooling agreement of the National Automobile Chamber of Commerce. The plan involved the agreement that 125 automobile manufacturers interchange their patent rights without payment of any money consideration, all with the view of making the modern American motor car a composite of the best that the engineering brains of the industry could produce. Most of the features of this broad piece of co-operation are the work of C. C. Hanch, who was at the time leader of the National Automobile Chamber of Commerce Patents Committee. The patents included were the major portion of all the important patents affecting the automobile. In a general sense, these patents were all "development patents" such as are always to be found in great number in the history of the development of any machine. To distinguish them from inventions that might be made later, of an entirely different character and representing radical departures from the existing engines, bodies and chassis, the inventions covered by these patents were called "Class A" patents. If any inventions of an entirely radical character representing a total departure from the previous construction known in the art were made, the patents on them were not to be included within the agreement and were to be called "Class B" patents. George F. Bauer, National Automobile Chamber of Commerce, in *Manufacturing Industries*, March, 1926, p. 207.

Seen and Heard—Discussion

By Maj. T. C. Fraser
Gun and Shell Factory, Cossipore, India

The article "Seen and Heard" on page 984, Vol. 63, of the *American Machinist*, is in itself complete proof of the necessity of a tolerance for every dimension, and a fit for every pair of mating surfaces. I have every sympathy and much fellow-feeling for Mr. Godfrey, but may I put in a plea for the inspector?

Here I may mention that I am not an inspector, but a manufacturer of articles requiring the fullest type of interchangeability.

The inspector has to do his best with the information given him. Should he have the ability to work out the fits and tolerances, he probably has not the time, and almost certainly has not the primary information, necessary. Also, if he had the ability, and his usefulness received due recognition, he would quickly be removed to another and better rewarded sphere.

On the other hand, it is to be presumed that the designer of the machines mentioned by Mr. Godfrey had some reason for selecting the sizes of the bolts. If he had, then he had the information whereby he could give the tolerances and fits for them (see British Engineering Standards Association pamphlets Nos. 190 and 191 of 1924 and corresponding publication of the American Bureau of Standards). Why did he not show the tolerances and fits on the drawing? Why should the manufacturer and the inspector have to work out for a second and a third time, the details which the designer had almost, if not entirely, completed?

Although inspectors have their faults, yet the fact remains that the more common situation is for the inspector to be put into an anomalous position through the designer not showing tolerances and fits on the drawing.

Why do manufacturers consent to work to incomplete drawings?

Big Men in Small Shops

By Entropy

The other day I was looking up names for a mailing list. I ran across the name of one of my neighbors who is president of a concern styled, "The United States ———— Co." Now, I always thought of him as president of a concern that, if not as large as U. S. Steel was a close second; so what was my surprise to discover that he was reported to have only ten employees. Then I kept a lookout for other little shops and to my further surprise I found multitudes of apparently prosperous businesses which reported less than fifty employees, and some of them were pretty well-known shops.

All this came just after I had been reading an editorial that deplored the tendency of modern business to consolidate into large plants, cumbersome to manage and so ponderous as to crush out all the little fellows.

A lot of these little fellows don't seem to know that they are being crushed. Some of them seem to drive pretty decent cars, own their own homes, keep up life insurance and otherwise comport themselves very much like regular citizens in good standing. Next I began to size up the little shops that I know myself, to try to discover how they could live, and finally came to the conclusion that most of them are really sales organizations with a shop as a handy appendage.

One chap, whose business cognomen is quite impressive, I surprised in his "shop" whose total floor area must have been approximately 100 sq.ft. Anyway, I had to stand in the doorway to interview him, because his little place was so full of "junk" that he couldn't work with anyone else inside. Small as his shop is it is typical of many others. He builds and installs power plants, any imaginable kind, anywhere. Of course, he does not build many of his engines in a shop ten feet square, nor does he rivet boilers there; but he has one little specialty, connected with an oil burner, the parts of which come to him from three different shops, and which he assembles himself. Most of his advantage in building power plants is based on this one invention. He keeps the thing to himself by the simple expedient of blocking the view of anyone who comes to see him.

Some of these little fellows buy the parts, supplies or whatever they need from the larger shops and most of them find these big shops ready and anxious to sell them. Some of the owners might make more money by getting a job with a big shop, but they figure that in that case, if they lose their job they are out entirely; while, doing business by themselves, they don't expect to get but a small fraction of the jobs they figure on. And so if they lose a job they only repeat what they are doing 80 per cent of the time.

Diction in Catalogs—Discussion

By G. B. Stuart

The article by B. J. Stern, in the *American Machinist*, Vol. 64, No. 11, page 438, on the subject of technical writing, hits the nail on the head, but does not drive far enough. It is unquestionably true that the average engineer or mechanic is frequently a poor writer. Engineers seem to be addicted to the use of pet phrases, locally coined words, and tremendously complicated and poorly constructed sentences.

The last fault is the worst. The mechanical man has thought out his problem, but his mind is impatient of the burden of writing it down, and travels ahead so fast that his writing is careless and faulty. The information is usually there, however, and the reader can grasp the idea if he studies the article long enough.

To my mind the solution is not to be found in trying to make writers out of engineers, but rather in making them realize their literary shortcomings. Why doesn't the engineer realize that good writing is an art that has to be developed by long intensive study? If the engineer has an idea for a new tool he calls in a toolmaker, and does not go out to a machine to attempt to do the job himself. Then, when he has an idea for a mechanical story, why doesn't he sketch it out and hand it to one of his men who has had experience in writing? There must be somebody in the plant who has given study to writing and can do a creditable job.

The signing of the article can be done with all self-respect by the executive who originated the idea. High government officials often have the technical parts of their speeches prepared by the various bureaus, and lawyers have their arguments briefed by clerks. Why doesn't the mechanical executive apply the same principle? The case cited by Mr. Stern is undoubtedly one of those where an official wanted to tell about the product himself, and the others didn't care to change his writing. It would have been better if he had let someone else write it first, and then have given it a final inspection himself for mechanical errors.

Milling Machines Handle Wide Range of Product

Special fixtures and automatic controls feature new equipment—Rigidity and an ample supply of coolant favor heavy cuts and fast feeds

NEW and diverse uses for milling machines in production work are being found each day, and while some of the machines are quite special, the majority of them are standard with the exception, in some cases, of the work-holding fixtures. These fixtures, in general, show a marked simplicity in construction details, and the complete absence of frills is to be noted. Furthermore they are rugged and massive so that chatter does not occur under the heavy cuts.

In Fig. 1 is shown an interesting operation in which slots of different lengths are milled around the periphery of a solid, machine-steel plunger. A special two-spindle, index fixture, mounted on the machine table, holds two pieces. The work is held between centers and the end locating and thrust carrying function is performed by the center which approaches the cutters first. Additional radial support is provided by half bearings mounted on adjustable standards and spaced about 15 in. apart. This mounting necessitates the accurate centering of only one end of the work, the end nearest the cutters. The indexing head has two spindles in which adjustable centers are incorporated and the work is revolved by means of dogs and drivers. The indexing is accomplished by the operator by means of the handwheels which are shown in the illustration.

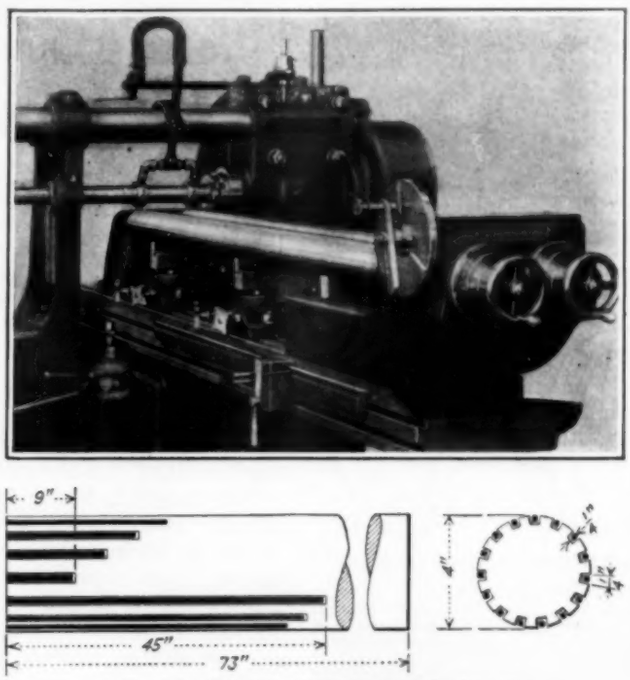


Fig. 1—Milling slots in a steel plunger

The method used to mill the grooves to different lengths is interesting since the arrangement is simple. A special index bar is mounted in the upper T-slot on the side of the table, and has holes drilled in it at intervals corresponding to the various groove lengths. In the lower T-slot is a special table-return dog which is located by a plunger which engages the holes in the index bar. The dog also carries two bars which engage the upright shift bar of the feed mechanism, the movement of which causes the table to return to its original position. The operator then indexes the work for the next cut, releases the plunger on the feed-trip dog and slides the dog to the next position where it is again locked in place.

Fifteen slots are milled in each plunger from 9 in. in length up to 45 in. The total time per piece is 38.6 minutes, the feed being 7.11 in. per minute. A large supply of cutter lubricant must be used. The arrangement shown in the photograph provides a large quantity of coolant in the right place.

An example of the continuous milling of small parts is shown in Fig. 2, the part being a magnet clamp assembly. The milling machine with which the operation of facing the clamps is performed is a vertical type and a new model. The table is provided with a special circular milling attachment on which is mounted the special work-holding fixture. Fifteen pieces may be held at once and are arranged in a circle. A cam clamp holds each piece, which is released by the operators as soon as the milling is completed. The station is then reloaded. The milling is, therefore, continuous.

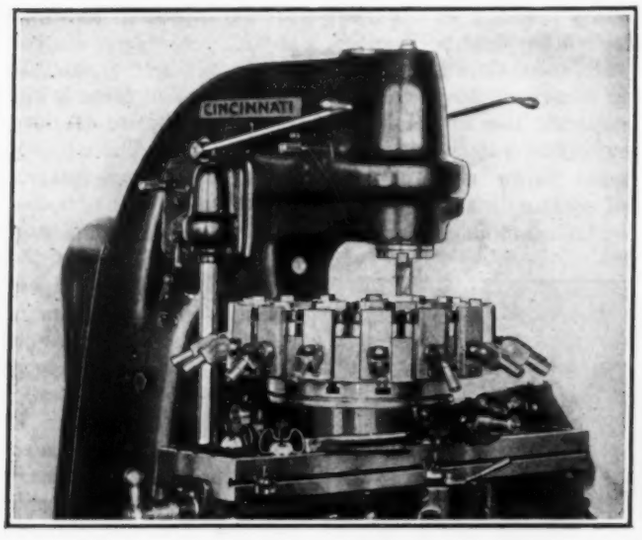
A 1½-in. spiral end-mill is used. The cut is ⅛ in. deep, and the feed is rapid. The production is about 500 pieces per hour.

The operation illustrated in Fig. 3 is interesting in many ways. It shows, for example, how the use of a special fixture is avoided by employing as a fixture the part which fits in the final assembly with the piece being machined. The piece in question is the base of another milling machine. A standard table, inverted, is used as the fixture and is clamped directly to the machine table. Accuracy is obtained by lining up the work from the sharp edge of the fixture-table; a gib is placed on the opposite side.

The operation is to face mill the pad for the feed box on the side of the bed. In order to provide a clearance for an extension on the base (cannot be seen in the photograph) a special extension is placed on the tool spindle which receives support from the rigid rectangu-

lar overarm. The cutter is 10 in. in diameter and the inserted blade type. In the illustration the cutter is just beginning a rough cut at a feed of 4¼ in. per min. and a cutting speed of 52 ft. per min. From ¼ to 7/16 in. of metal is removed depending upon variations in the castings. When finish milling, the feed is increased to 5⅜ in. per min. and the speed to 65 ft. per min., but the depth of cut is only from 0.005 to 0.015 in. The order of milling is across the top, down one side, back across the bottom, and then up to the starting point. Upon completion of the milling the pad is tested for perpendicularity with the base to within 0.002 in. by an indicator fixed to the finished table bed.

The operations described from this point on are all concerned with the production of automotive parts, but the feature of wide diversity still prevails. Fig. 4 shows ball yokes of a universal joint being milled between the fork. The part is a mild steel forging and the milling machine is of the plain automatic type.



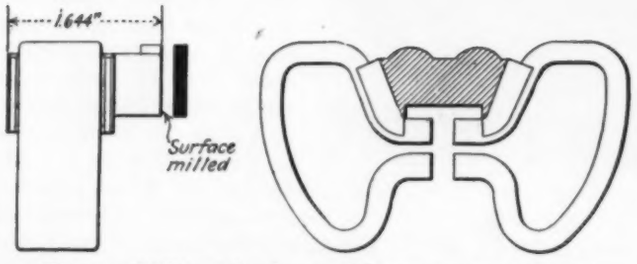


Fig. 2—Milling the faces of brass magnet clamps

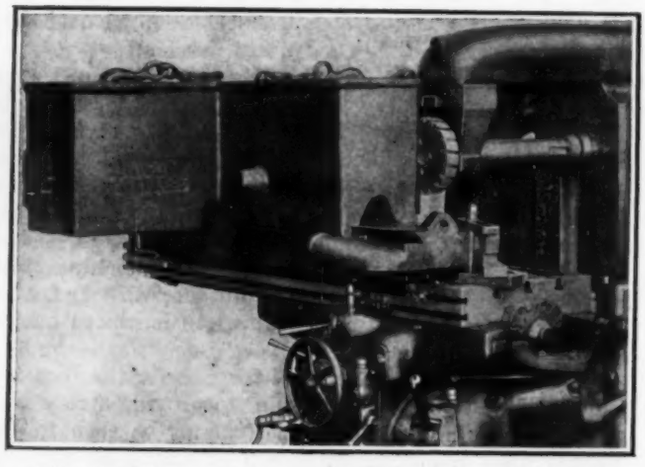


Fig. 3—The use of a special fixture was eliminated in this operation

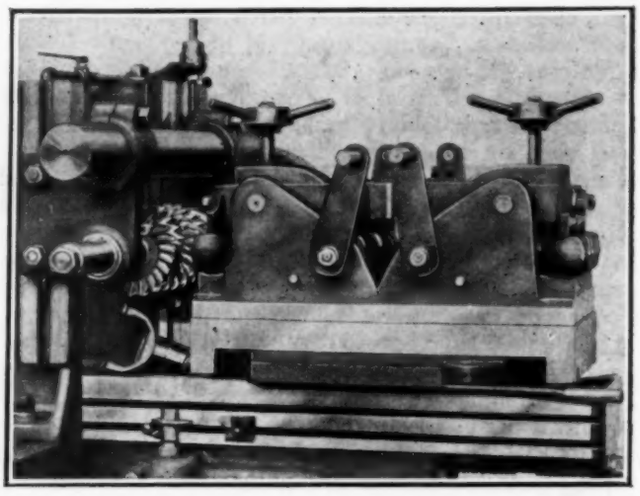


Fig. 4—An example of gang milling with an indexing fixture

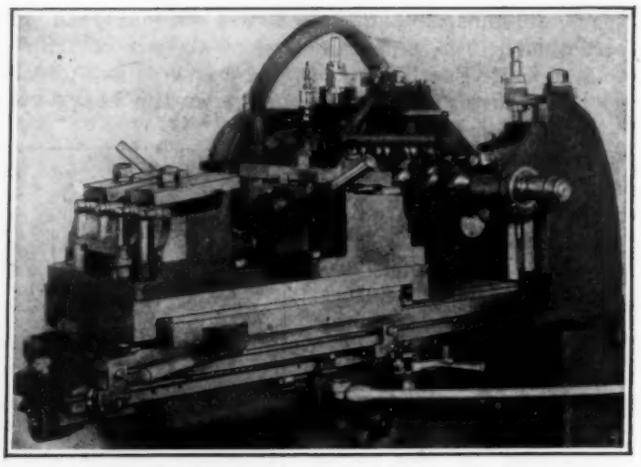
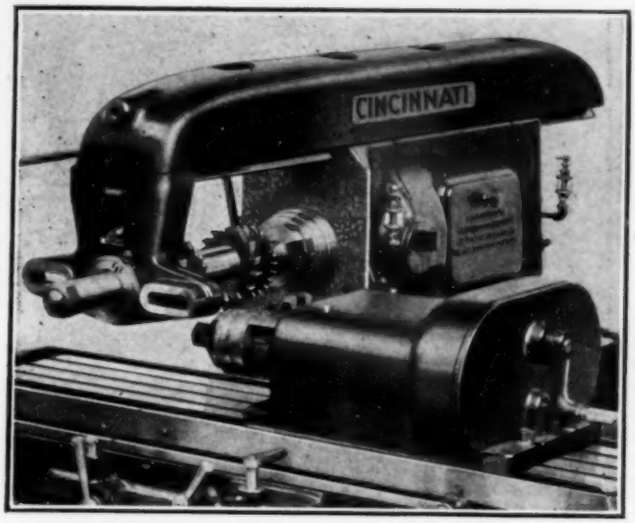


Fig. 5—Gang milling of small parts

The rugged indexing fixture is special and is mounted directly upon the table of the machine. It measures 16 in. by 30 in. at the base and indexes 180 deg. at a throw. Four yokes are held at a time, two being milled and two being loaded. The shank of the yoke has been finished in a previous operation and the work is lined up for milling against this turned surface; the pilot wheels shown at the top of the fixture perform this function. Additional clamping is obtained through levers which are actuated by separate cams which in turn are controlled by crank arms. This construction can be plainly seen in Fig. 5.

Four 7½-in. diameter, half-side mills are mounted on an arbor 2 in. in diameter which is additionally supported with an outboard bearing. The feed is 2⅝ in. per minute and 1/16 to 7/16 in. of metal is removed. Two yokes are finished at one pass of the table. The time for one complete cycle is 0.94 min.: this includes the time to mill, the time to return and the time to index the base and advance the work to the cutters. Since loading is accomplished while the milling is being performed, this operation practically amounts to continuous milling.

Another example of gang milling in conjunction with



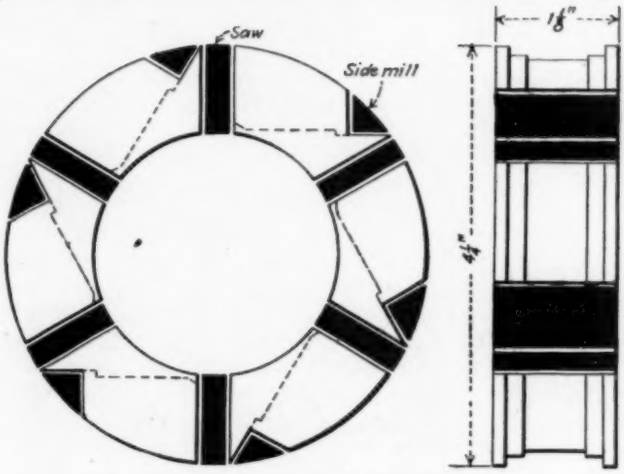


Fig. 6—A two-spindle indexing fixture

an indexing fixture is shown in Fig. 5. Two camshaft thrust blocks and two fanshaft studs are mounted in parallel on each end of the fixture. The operation is to mill the flats on all four pieces at once. Each piece is mounted in V-blocks and is held by two clamps, one for each pair; the clamps are actuated by a single cam which in turn is controlled by means of the hand lever shown. The camshaft thrust blocks receive additional support from vertical rods touching the bottoms of the buttons. As in the previous example, while one set of pieces is being milled, the other set is being loaded in the fixture. Note the heavy construction of the indexing fixture which is necessary to prevent chatter under the heavy cuts. The cutter spindle is also rigidly supported by the special extension bracket. There are four cutters 6 in. in diameter and four cutters 5 in. in diameter of the half-side mill type. The spindle rotates at 49 r.p.m. and the feed is 2.4 in. per minute. A good flow of coolant is maintained at each cutter by a piping arrangement which has a series of nozzles to direct the stream to the cutters. The time per piece is 0.22 min.

An entirely different operation is shown in Fig. 6; this is one of combined milling and sawing. The machine is a knee and column type miller. A special two-spindle, 60-deg., hand-indexed fixture is mounted on the machine table and is the only special part of the equipment. Two blanks are mounted on each spindle and two sets of cutters, each consisting of a side mill and a saw, are mounted on the tool arbor.

The blanks fit over the index-spindle nose and are held in place by a six-leg spider clamp. Each blank is sawed into six parts and is notched by the side mill as can be seen in the sketch. The dash lines indicate subsequent operations on the piece which is a part of the cam or shoe of an automobile front wheel brake. The saws are 5 in. in diameter and are $\frac{1}{16}$ in. thick, and the half side mills are also 5 in. in diameter, but their thickness is increased to $\frac{3}{4}$ inch.

An example of duplex milling on a highly special automatic machine is shown in Fig. 7. Although somewhat complicated, the machine works well and turns out a very high production for this class of work. The indexing table shifts automatically at the completion of the cut and the withdrawal of the tools. Two special headstocks that are worm driven are also used. Each headstock carries two short stub spindles, which may be adjusted independently.

The operation consists of milling the flats on the bolt bosses of an automobile engine connecting rod and sawing off the bearing cap. Three cutters are arranged in series on the spindle. The outside cutter (relative to the spindle carrier) is a side mill $4\frac{7}{16}$ in. in diameter; the inside cutter is also a side mill but is $5\frac{1}{2}$ in. in diameter; the middle cutter is the saw which is $5\frac{1}{4}$ in. in diameter and $\frac{1}{16}$ in. wide. The set of cutters finishes one side of the connecting rod and a similar set finishes the other. The work is fed into the cutters and two pieces are completed at once with the duplex arrangement shown.

The connecting rods are held in pairs in special fixtures, which are bolted to the indexing table. The rods are mounted with their major axes crossways to the table, but parallel to each other. The finished wrist-pin hole fits over the locating stud on the fixture and clamping of the piece is accomplished by a spring cone in the rough crankpin hole. The connecting rod is forged solid

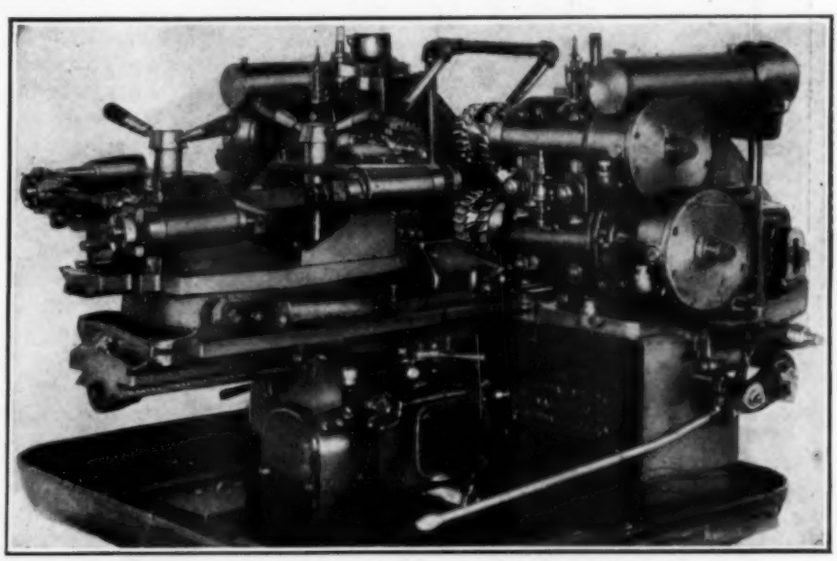


Fig. 7—A duplex automatic miller performing several operations on a connecting rod

and a hinged C-washer is used as the clamping part between the rod and the stud of the cone. The movements of the cone are controlled by a cam which, in turn, is operated by the two-handle pilot wheel.

The side mills remove about $\frac{1}{8}$ in. of stock from the part, which is a steel forging. The feed is 2.4 in. per min. and the time per piece is 0.69 min. A large supply of coolant is necessary and flows directly to the cutters through ample piping.

A further application of duplex milling in conjunction with an indexing base is shown in Fig. 8. This machine is also entirely automatic and the only part the operator plays is in loading and unloading during the time that the work on the opposite end of the table is being fed to the cutters. Dogs control the feed of the table and the rapid-return traverse (at twice the cutting feed) as well as the automatic indexing of the table.

The piece being machined is a main bearing cap of an automobile engine, and the operation is to mill the ends for proper clearance in the cylinder block. The caps have been previously finished on the sides and parting face. Four of them can be clamped together, side by side, in a vise; they are located endwise by dowel pins in one of the drilled bolt holes. The caps are steel forgings. The work is performed by two Stellite shell end mills located opposite each other on special spindles. About $\frac{1}{16}$ in. of stock is removed. The production is 65 sets per hour, or 260 pieces; the time per piece is conversely 0.20 min. Note the large pipe for carrying the cooling lubricant to the cutters.

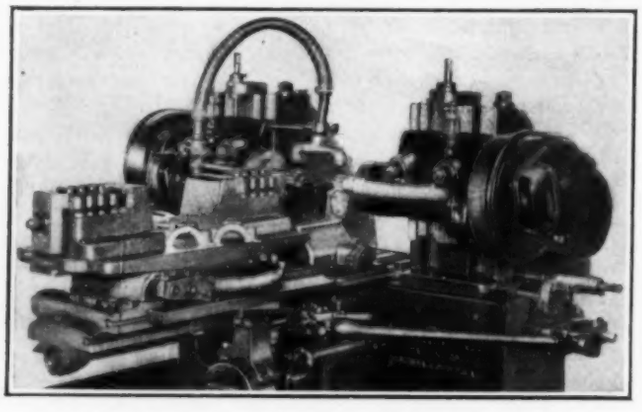
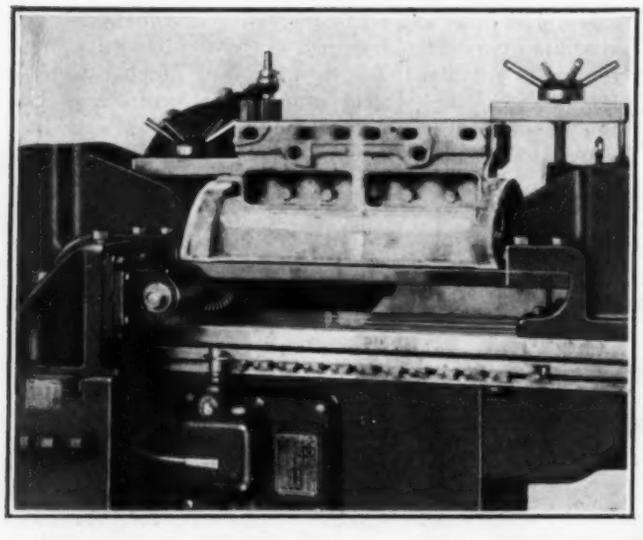


Fig. 8—End milling of main bearing caps



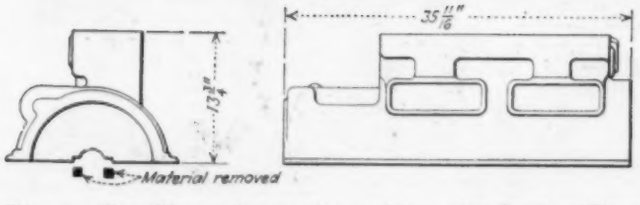


Fig. 9—Handling a large piece with a standard milling machine

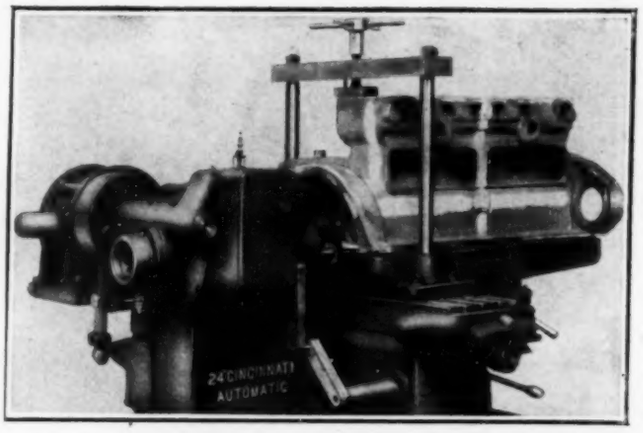


Fig. 10—Some novel features are incorporated in this special machine

Two operations on a six-cylinder engine block, illustrated in Figs. 9 and 10, are unusual in many ways. In the first place, the work being handled is large for a standard milling machine such as the one indicated in Fig. 9. In this case, the only special parts are an extra long table, 72 in., and the two end-standard supports for the bridge-type fixture which carries the cylinder block. The block was previously finished on the crank-case parting line which now offers a flat seat. It is located endwise by pins which fit into two $\frac{3}{4}$-in. reamed holes, and is held by clamps at each end as can be plainly seen in the illustration.

The operation in Fig. 9 is to mill the bearing cap seats. Two 7-in. diameter, inserted-blade, half-side mills are used on the spindle, which receives additional support from an outboard bearing. About $\frac{1}{16}$ in. of stock is removed from the block, which is gray cast iron. One of the most interesting features of this layout is the intermittent feed which permits rapid traversing through the "air gaps." This feed is controlled by a series of dogs placed in the T-slot along the front side of the table. The work is loaded at the front end of the machine and is removed from the table in the rear position without being returned through the cut. The result is that the time per cylinder block is only 2.80 minutes.

The machine shown in Fig. 10 is a special unit although it is made up of standard milling machine parts. The piece being worked is the same as shown in Fig. 9, being a six-cylinder engine block, and, in fact, the present case is the following operation. The object is to cut an oil groove in the rear bearing bushing. The block is held in a special fixture which is bolted directly to the machine table. As before, the block rests upon two cross rails on the finished surface at the crankcase parting line, and is held in place by a single clamp.

A cutter $1\frac{3}{4}$ in. in diameter is mounted on a special spindle which, in turn, is mounted in an eccentric sleeve. Instead of the table being traversed, the feed movement is accomplished by the rotation of this eccentric sleeve. The time per piece is 1.50 minutes.

Ideas from Practical Men

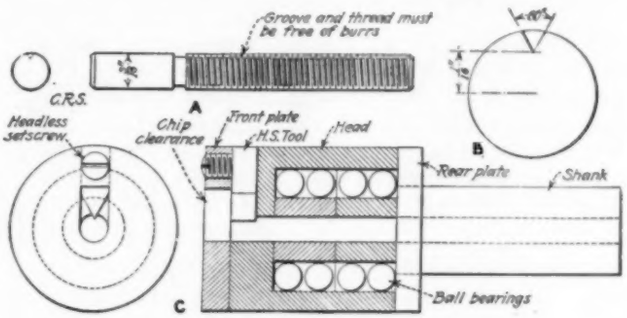
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Broaching Tool for the Screw Machine

BY I. F. HERBES

We had a large quantity of studs to make, such as the one shown at *A* in the illustration. Besides being threaded, the studs had a 60-deg. V-groove broached the entire length of the thread, the depth of the groove being the same as the depth of the thread. An enlarged view of the end is shown at *B*.

The work was being done on a hand screw machine at the rate of 400 per day, using a self-opening diehead for threading, and a box tool for broaching the groove. We had no trouble in broaching, but the production was low, owing to the necessity of stopping the machine



Tool for broaching grooves in studs

for the operation. To obviate stopping the machine, we made the broaching tool shown at *C*. It consists of a revolving head mounted on ball bearings and carrying a broaching cutter, substantially as shown.

In operation, the tool is brought forward and engages the stock, which causes it to rotate at the same speed as the latter, while further forward movement of the turret completes the broaching. The production was increased to 650 per day.

The tool worked so well that we finally put it on a No. 0, Brown & Sharpe automatic and are now getting a production of 3,500 pieces per day.

Removing Chips from Drilled Holes

BY FRANK V. FAULHABER

When drilling holes of considerable depth, it is necessary to remove the chips from the holes from time to time, and a means frequently employed to remove them is to blow them away with the breath. Aside from the danger of having bits of metal enter the eyes of the operator, this method causes more dust to be blown about than is necessary and is wearying to the operator.

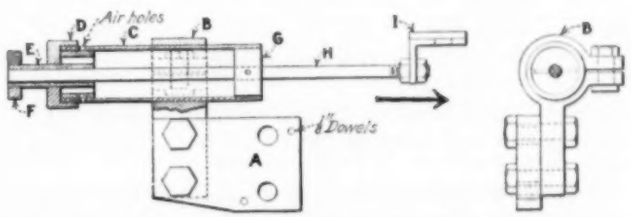
The work may be kept clean and the operation speeded up by using a magnetized piece of steel that can be inserted into the hole. One operator has provided himself with a number of magnetized steels of different sizes, since different sized holes must be drilled, and these magnets have made for quicker and neater work, besides eliminating the eye hazard. As the operator withdraws the magnet from the hole he merely wipes it across his apron to remove the chips that cling to it.

Simple Recoil Cylinder Mechanism

BY J. E. FENNO

The mechanism here shown was designed for use on a machine having a slide that received its motion in the direction of the arrow from a peripheral cam, and its return movement from a coil spring. If provision was not made for stopping the slide quietly at the end of the return stroke, the resulting jar would cause trouble with a feed dial that was a part of the machine.

The plate *A* is stationary and is fastened to the machine with cap-bolts and dowels. Fastened to plate *A*



Mechanism of recoil cylinder

is the bracket *B*, with a split boss to grip the brass tube *C* firmly and also to provide lengthwise adjustment for the same. The cap *D* is screwed to the end of the tube and has a reamed hole in which the aluminum slide-valve *E* is a sliding fit; as it also is in the tube.

The collar *F* prevents further movement of the valve than is desired. The brass piston *G* is pinned to the rod *H* and the bracket *I* is fastened to the rod as well as to the machine slide from which it receives its motion.

The action of the mechanism is as follows: The machine slide pulls the rod *H* and the piston *G*, causing a partial vacuum in the cylinder *C* which results in a forward movement of the valve until the collar strikes the cap. The position of the valve now allows air to enter through small air ports in the tube *C* and thence through the valve and into the cylinder. This is all accomplished by the time the slide reaches the forward end of the stroke.

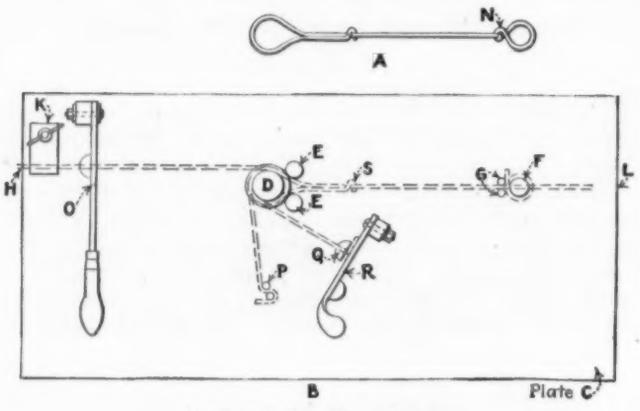
After the return stroke has begun, the air in the cylinder is compressed sufficiently to force the valve back again, thereby closing the tube and allowing the further compression to form a cushion until the return stroke is completed. Sufficient clearance between the sliding surfaces of the valve and tube is provided to allow the compressed air to gradually escape during the return stroke.

The slide noted at the beginning of the description carries a pawl that engages with a ratchet, the latter being integral with and on the same shaft with a dial plate which holds the work in a forcing press.

Bending Small Wire Articles

By Alex. Dowel

Small wire articles are made commercially and in large quantities on some variety of wire bending machines. In small quantities, however, the cost of the dies for these machines makes their use impossible, so that other means must be employed. For small lots of 10,000 or less, when wire of 0.030 to 0.050 in. diameter is to be bent into some form similar to that shown at *A*, the work can be done quite well and quickly by making



A simple bending fixture

a simple, hand-bending fixture as at *B*, which can be arranged to be bolted to the bench or to be held in a vise.

A steel or cast-iron plate *C* is provided with pins at *D*, *E*, *F*, and *G;* pins *D* and *F* each having a shoulder about $\frac{3}{4}$ in. above the plate to allow clearance for working while making some of the bends. The pins mentioned are suitably spaced to give the main dimensions of the form required.

In operation, the wire is drawn from a coil at *H*, under the adjustable tension clamp *K*, past the pin *D* and between the pins at *E* and *G* (passing over pin *F*) to the length as determined by the edge of the plate at *L*. It is then bent around pin *F* and the end turned downward, pushed under, and twisted with a pair of small pliers to form the portion *N*. Then the wire is cut at *O* and bent around the pins at *P* to form the hook. Next, it is lifted off of these pins and carried over the pin *Q*, at which point the little lever *R* is used to form the right-angle bend in the hook, after which the hook is caught over the straight portion of the wire at *S*, and the piece is lifted off of the pins.

Of course, a simple fixture like this will not do for music wire, or any other wire that is too stiff to bend with the fingers. With a little practice, a man can make pieces like that shown in surprisingly quick time.

Fixture for Grinding Threading Tools

By W. C. Landis

Grinding threading tools, especially internal tools, to the correct angularity is a tedious and painstaking job.

The fixture shown in Fig. 1, and in detail in Fig. 2, was designed to increase the accuracy and decrease the time and care necessary for doing the work properly.

In operation, the fixture is used on the magnetic chuck of a surface grinder. By its use we are able to

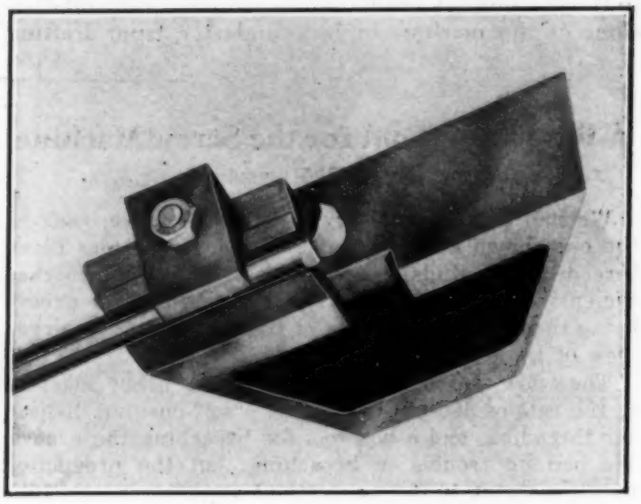


Fig. 1—Fixture for grinding threading tools

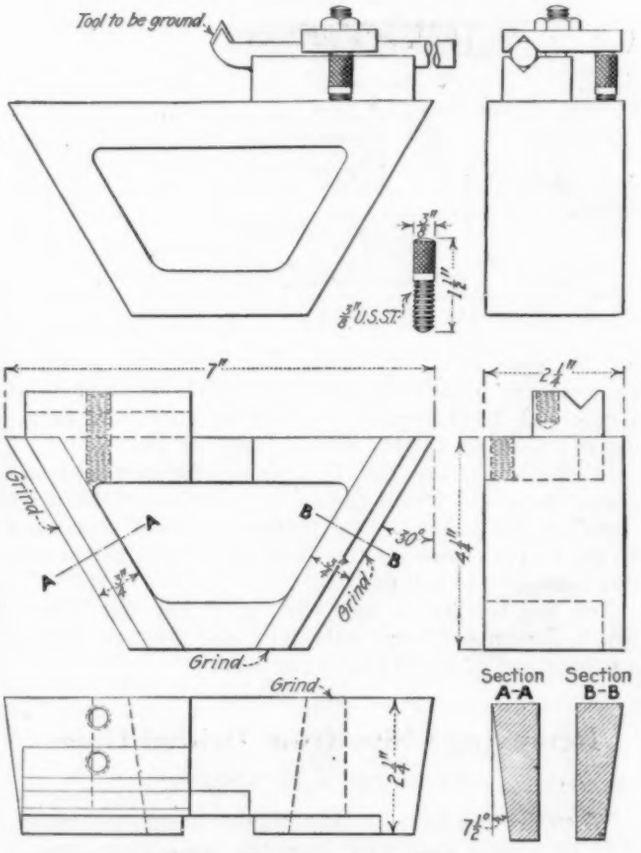


Fig. 2—Details of the fixture

grind the sides of the tool to the correct form and clearance, and to grind the top flat. The grinding requires but one setting of the tool in the fixture and three positions of the fixture on the magnetic chuck.

Selecting Tap Drills

BY GEO. F. JOHNSON

Some time ago I saw a discussion in the *American Machinist* as to troubles over tap breakage due to using the same size tap drill in all sorts of materials. I have looked weekly to see someone come through with a suggestion, but with no results so far. I had my troubles along that line, and devised a solution that may be of interest to the readers of the *American Machinist*.

The depth of thread for any particular job is best answered by long practice with the materials being tapped, by the uses to which the tapped holes are subjected, and by the manner and speed required in tapping the holes. What may be excellent practice in a small shop where nicety of workmanship is the object may be the unwise thing in the manufacturing plant where production is the primary object. If a ¾ depth thread gives the required service, it is foolish to waste the time, effort, and the extra taps required to obtain the full theoretical depth of thread. When your contract specifies "full and perfect threads," remember that the phrase contains a large sized hook.

In general it may be said that it is wise to use the ¾ and ⅞ depth thread in the case of taps of ¼ in. diameter and above. In the case of taps of less than ¼ in. diameter it is wise to use the ¾ and ⅝ depth except in the case of very small diameter taps where the ½ depth serves well and avoids excessive tap breakage. In all these cases, however, the final decision is found in the service the tapped hole is to give.

To find the proper sized drill for any given tap and for any given depth, or fullness, of thread I make use of a "constant," which is 1.299 for the full depth thread of any tap containing the United States Standard thread. For the ⅞ depth thread of any given tap it would be seven-eighths of that figure. Thus we would have the following constants for the five different depths of these threads:

1.299 ---- the constant for the full depth thread
1.136 ---- " " " " ⅞ " "
0.975 ---- " " " " ¾ " "
0.812 ---- " " " " ⅝ " "
0.650 ---- " " " " ½ " "

To find the tap drill size for a 1-in.-8 tap where we want a ¾ depth of thread, we divide the constant 0.975 by the number of threads per inch on the tap, which in this case is 8. This results in the figure 0.122. Subtracting 0.122 from the outside diameter of the tap, which in this case is 1.000 in., we get 0.878 in., or the mathematically correct size of drill to be used as the "tap drill" for a 1-in.-8 tap where a ¾ depth thread is desired. By reference to a chart of standard drill sizes it is found that 0.875 in., or ⅞, is the nearest standard size to 0.878 in. Therefore, using the ⅞-in. drill as the tap drill for a 1-in.-8 tap results in a thread that represents current shop practice and which can be produced rapidly without tap breakage. In service it will not strip even under great tension. In fact, this ¾ depth thread, in the ductile metals, will be found to be in reality about ⅞ of the theoretical full depth of thread due to the spinning action of the tap.

As a ready reference we have worked out the accompanying tables of drill sizes for the more commonly used taps in each of the three standards, namely U.S.S., S.A.E., and A.S.M.E.

Table I—Drills for A.S.M.E. Taps

No.	Thds. per Inch	Tap Drill No. or Size				
		Full Depth	⅞ Depth	¾ Depth	⅝ Depth	½ Depth
0	80	57	56	3/64	55	55
1	72	54	53	53	1/16	52
2	56	1/16	52	51	50	49
3	48	49	48	46	45	44
4	36	48	46	44	43	3/32
5	40	42	40	38	37	7/64
6	40	36	35	33	32	31
6	32	40	37	7/64	33	32
7	32	34	32	31	1/8	30
8	32	1/8	30	29	28	27
9	32	29	9/64	26	24	22
10	32	25	23	21	19	18
10	24	29	27	25	5/32	20
12	24	20	18	17	14	12
14	24	3/16	9	7	4	3
14	20	16	13	10	7	4
20	20	F	11/64	I	K	L
20	18	¼	F	H	J	9/32

Table II—Drills for U.S.S. Taps

Outside Diam.	Thds. per Inch	Tap Drill No. or Size				
		Full Depth	⅞ Depth	¾ Depth	⅝ Depth	½ Depth
¼	20	13	10	7	4	7/32
5/16	18	C	¼	F	H	I
⅜	16	M	N	5/16	P	Q
7/16	14	U	T	U	V	25/64
½	13	Y	Z	27/64	7/16	29/64
9/16	12	33/64	31/64	31/64	1/2	33/64
5/8	11	17/32	35/64	35/64	37/64	9/16
¾	10	41/64	39/64	39/64	41/64	21/32
⅞	9	49/64	47/64	45/64	43/64	25/32
1	8	57/64	55/64	53/64	7/8	29/32
1⅛	7	1 1/64	63/64	61/64	1	1 1/32
1¼	7	1 9/64	1 7/64	1 5/64	1 3/64	1 1/32
1⅜	6	1 25/64	1 23/64	1 21/64	1 19/64	1 17/64
1½	5	1 1/2	1 49/64	1 47/64	1 45/64	1 5/8

Table III—Drills for S.A.E. Taps

Outside Diam.	Thds. per Inch	Tap Drill No. or Size				
		Full Depth	⅞ Depth	¾ Depth	⅝ Depth	½ Depth
¼	28	6	4	3	2	1
5/16	24	F	I	J	9/32	
⅜	24	P	Q	R	S	
7/16	20	V	W	X	13/32	
½	20	7/16	25/64	13/32	29/64	15/32
9/16	18	1/2	29/64	27/64	15/32	33/64
5/8	18	9/16	33/64	31/64	17/32	37/64
¾	16	5/8	37/64	35/64	19/32	41/64
⅞	14	25/32	13/16	3/4	11/16	45/64
1	14	29/32	15/16	7/8	13/16	53/64
1⅛	12	1 1/64	1 3/64	1 1/64	1 1/16	1 1/64
1¼	12	1 5/64	1 7/64	1 5/64	1 3/64	1 1/32
1⅜	12	1 13/64	1 11/64	1 9/64	1 7/64	1 5/64
1½	12	1 21/64	1 19/64	1 17/64	1 15/64	1 13/64

To face an exact dimension from the side or the end of a piece when the compound rest is offset 30 deg., touch the work with the tool and feed the compound rest double the amount to be removed.

To face an exact dimension from the side or the end of a piece when the compound rest is set at 45 deg., touch the work with the tool and move the compound rest 0.0141 in. to remove 0.010 in., or in proportion as necessary.

Electric Heater for Gasket Rings

By Frank C. Hudson

The annealing of copper gasket rings, so as to secure a uniform "softness" is done electrically in the Battle Creek shops of the Grand Trunk Railway. The gaskets vary in size and are used on steam chests, dome covers, cylinder heads, etc. The ring shown in Fig. 1 is made of ¼-in. copper wire and is 28 in. in diameter.

The heating device is a sort of transformer, built up of laminations and has a coil wound with 150 turns of Deltobeston wire as shown in Fig. 2, which gives details of its construction. The ring to be annealed is not clamped in the heater but merely laid in place and the current turned on.

A ring of average size can be heated to a dull red for ½ cent, at the prevailing shop rate for current. When the ring reaches a dull red, the current is shut off, the front or swinging frame pulled out and the ring dropped into the cooling tank below. Full details are given in Fig. 2, from which a heater can readily be constructed by any one who desires to do so.

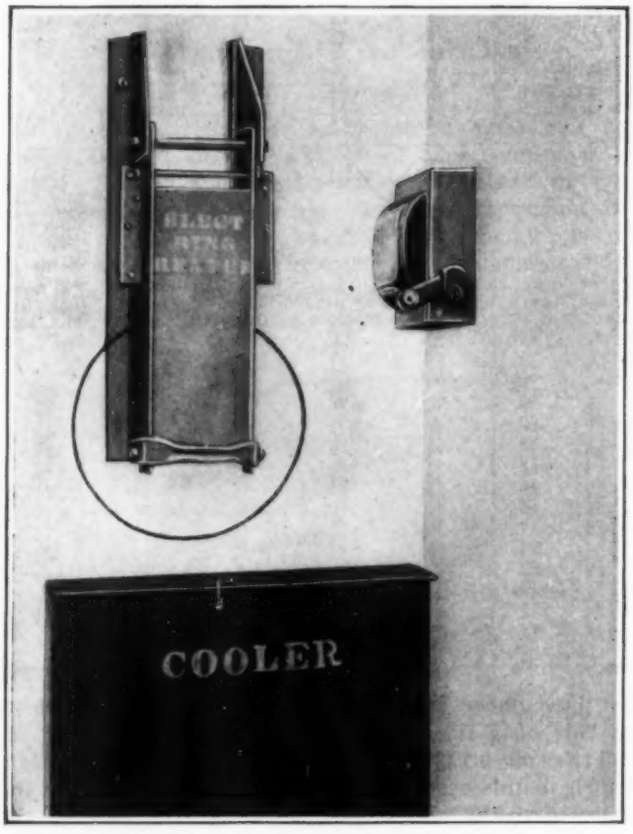


Fig. 1—Electric gasket heater and switch control

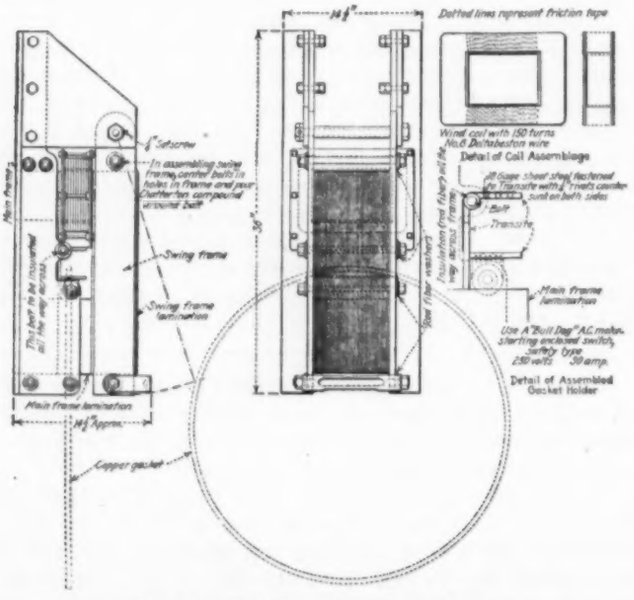

Dotted lines represent friction tape
Wind coil with 150 turns No.8 Deltabeston wire
Detail of Coil Assemblage
Swing frame
Main frame lamination
Copper gasket
Detail of Assembled Gasket Holder

Fig. 2—Details of heating device

Using a Hand Reamer in a Lathe—Discussion

By H. S. Steele

On page 488, Vol. 64, of the *American Machinist* Philip F. Shafran takes exception to my arbitrary statement that a hand reamer should not be used in a lathe. I am very glad that he did so, because it gives me an opportunity to point out the evils of the practice; evils of which Mr. Shafran apparently is unaware, because they are involved to little, if any, less degree in the method he advocates, whether he pulls the belt by hand or locks the lathe spindle and turns the reamer by hand. A hand reamer is designed to be used in a manner that permits the sensitiveness of hand control to give the user instant warning when any condition that the reamer may encounter is unfavorable, and it should *never be guided by anything but the hole it is to ream.* If the lathe in which a hand reamer is used happens to be out of alignment to the slightest degree (and most of them are, even more than that) the reamer will not cut to size.

A hand reamer does not need a screw back of it to "feed" it. There is no more excuse for feeding a hand reamer by screw pressure than there is for feeding a sensitive drill in the same manner. If too much manual effort is required to hand ream a hole, the fault lies with the man or the system that leaves too much stock to be removed by it. If a hand reamer when used by hand leaves a chattered hole there is something wrong with the reamer.

A properly-made hand reamer used to ream a hole that has been bored or machine reamed to a size leaving a proper hand-reaming allowance, will enter the hole for at least one-third of its length and will have a good bearing in the hole to guide it. If, under these conditions, a man reams a hole out of the original alignment established by the preceding operation, he does so only by deliberate intent or by extreme carelessness.

If Mr. Shafran or anybody else *must* use a hand reamer in a lathe, don't, for the love of Pete, allow the tail of the dog to rest on the cross-slide or carriage; put a stick of wood across the shank of the reamer in such manner that the outer end of the stick rests upon the lathe shear and the tail of the dog rests upon the stick—and don't use too big a stick.

The energy to turn a hand reamer should be applied in equal measure to points equidistant and opposite to the center of the reamer, in order to balance the forces applied, leaving no unbalanced force to cause the reamer to cut to one side. The stick method partly, but not wholly, balances the forces. With the tail of the dog resting upon a rigid support, the force is wholly unbalanced, and I will venture to say that no man ever reamed a hole accurately to size in that way.

Heat-Treatment for Nickel Steels

Nickel steel was first produced in France in 1885. In 1890 it was tried by the United States Government for armor plate. It is now used extensively for ordnance and armament, and also has a wide variety of commercial uses for such parts as steering knuckles, propeller and drive shafts, crankshafts, gears, and axles. Nickel lowers the critical point, increases the elastic limit and tensile strength, and increases the toughness of steel. It retards the grain growth of steel and permits a greater range of heating, and a longer period above the critical point, without damage to the steel. The treatments designated in the accompanying table are intended for forgings or for parts from bar stock. Nickel steel castings generally required more severe treatment to break up the original structure.

The S. A. E. system of specification numbers is used. The basic numeral is the first digit, straight nickel being indicated by 2, and nickel-chromium by 3. The second digit indicates the approximate percentage of alloy, and the last two figures show the average carbon content in "points." Thus 2,315 indicates a nickel steel of approximately 3 per cent (up to 3.75 per cent) of nickel, and an average carbon content of 0.15 per cent (0.10 to 0.20 per cent). Steels with varying nickel content have been used in the past, but in this country the 3.5-per cent nickel, S. A. E. 2,300, is now generally the standard.

It requires heat-treatment to bring out the best properties of the 2,300 class of nickel steels. The choice of a quenching medium depends upon the carbon content, shape, and size of the parts. Annealing after forging will avoid warpage, and put the steels in better machining condition.

The 3100 class of nickel-chromium steels have their widest application in the medium carbon range for general forging purposes. The steels with from 0.20 to 0.30 range of carbon have high ductility with good strength, and need only quenching in water for hardening. For small parts made of these steels annealing can often be omitted after forging. The 3100 class of steels having a carbon range from 0.30 to 0.40 have higher strength and greater hardness. They require annealing after forging, and are usually quenched in oil for hardening. The steels in this class with carbon content above 0.40 are lower in ductility, but have as high tensile strength. They have deep hardening properties, and are sometimes difficult to anneal for machining.

The 3200 nickel-chromium steels find their greatest usefulness through a range of carbon from 0.25 to 0.55. They produce better physical properties and harden deeper than the 2300 or 3100 classes, therefore they are especially useful for large sections. The high chromium permits higher hardening temperatures, and gives a steel that has great ductility and toughness. For annealing the higher carbon steels of this class the furnace cooling must be at a very slow rate, not more than 50 to 75 deg. F. per hour to 1,100 deg. F.

The forging and structural steels in the 3300 series have high physical properties, and harden deeply. A simple anneal is generally sufficient for the lower carbon steels in this class. The nickel-chromium steels from 3435 to 3450 can be machined and heat treated easily, and do not require the care necessary in the 3200 and 3300 series.

Treatment for Annealing or Hardening Nickel Steels

S.A.E. Steel No.	Purpose of Heat Treatment	Heat to Degs. F.	Cooling Method	Reheat to Degs. F.	Quench	Temper Degs. F.
2315—2320	Anneal to prepare for machining	1600—1650	Air, cool slowly			
2330—2335	Anneal to prepare for machining	1550—1600	Furnace, or slowly in air			
2340—2340	Anneal to prepare for machining	1500—1550	Furnace			
2512	Anneal to prepare for machining	1550—1600	Furnace			
3115, 3120, 4615	Anneal to prepare for machining	1625—1675	Air			
3125—3130	Anneal to prepare for machining	1575—1625	Air, cool slowly			
3135—3140	Anneal to prepare for machining	1550—1600	Furnace, or slowly in air			
3215—3220	Anneal to prepare for machining	1625—1675	Air			
3230—3240	Anneal to prepare for machining	1575—1625	Furnace			
3245—3250	Anneal to prepare for machining	1500—1600	Slowly in furnace			
3212, 3415	Anneal to prepare for machining	1600—1650	Slowly in furnace			
3325, 3435, 3450	Anneal to prepare for machining	1550—1600	Slowly in furnace			
2340, 2345, 2350	Annealing, for high alloy steels	1500—1550	Furnace or air	1250—1300	Furnace	
3230, 3240	Annealing, for high alloy steels	1575—1625	Furnace, or slowly in air	1250—1325	Furnace	
3245, 3250	Annealing, for high alloy steels	1550—1600	Furnace	1250—1325	Furnace	
3325, 3335, 3340	Annealing, for high alloy steels	1550—1650	Air or furnace	1250—1325	Furnace	
3450	Annealing, for high alloy steels	1550—1600	Furnace, or slowly in air	1250—1300	Furnace	
2315, 2320	Annealing, for high alloy, large pieces	1600—1650	Oil or water			To desired hardness
2330, 2335	Annealing, for high alloy, large pieces	1550—1600	Air	1450—1500	Oil or water	To desired hardness
2340, 2345, 2350	Annealing, for high alloy, large pieces	1550—1600	Air	1425—1475	Oil	To desired hardness
2512	Annealing, for high alloy, large pieces	1550—1600	Air or furnace if rough machined	1450—1500	Oil or air	1100—1200
3125—3130	Annealing, for high alloy, large pieces	1600—1650	Oil or water			To desired hardness
3135—3140	Annealing, for high alloy, large pieces	1550—1600	Air	1475—1525	Oil or water	To desired hardness
3230—3240	Annealing, for high alloy, large pieces	1575—1625	Air	1475—1525	Oil	To desired hardness
3245—3250	Annealing, for high alloy, large pieces	1550—1600	Air	1425—1475	Oil	1250—1325, cool slowly
3325, 3335, 3340	Annealing, for high alloy, large pieces	1550—1650	Air	1450—1500	Oil or air	1250—1325, cool slowly
3435	Annealing, for high alloy, large pieces	1550—1650	Air	1425—1450	Oil or air	To desired hardness
3450	Annealing, for high alloy, large pieces	1550—1600	Air	1400—1450	Oil	1200—1250
2330, 2335	Hardening and toughening	1425—1475	Oil or water			To desired hardness
2340	Hardening and toughening	1400—1450	Oil			To desired hardness
2345, 2350	Hardening and toughening	1375—1425	Oil			To desired hardness
3125, 3130	Hardening and toughening	1500—1550	Oil or water			To desired hardness
3135, 3140	Hardening and toughening	1475—1525	Oil or water			To desired hardness
3240	Hardening and toughening	1450—1500	Oil			Quench above 750
3245, 3250	Hardening and toughening	1425—1450	Oil			Quench above 750
3325	Hardening and toughening	1450—1500	Oil			Quench above 750
3335, 3340	Hardening and toughening	1400—1450	Oil			Quench above 750
3435	Hardening and toughening	4125—1475	Oil			Quench above 750
3450	Hardening and toughening	1375—1425	Oil			Quench above 750

For the information given we are indebted to the A.S.S.T.

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Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Designing a Modern Machine Shop

Q. We intend to build a new machine shop this spring that will measure approximately 260x90 ft. and shall appreciate having from you any suggestions that you may desire to make.

In other words, if there are any new wrinkles or up-to-the-minute ideas in regard to machine shop layouts, we would like to hear of them at once so that everything up-to-date will be incorporated in our new plant.

A. Let us suggest that you look over the April 1st issue of the *American Machinist*, which contains a description of the new Gray Planer Co. plant in Cincinnati. This plant has just been opened and is modern in every respect.

No attempt has been made to our knowledge to lay out a model machine shop suitable for all purposes, due principally to the fact that specific conditions make alterations necessary in certain items, and no one lay-out is, therefore, practical.

We believe that the best plan to follow in order to get all the ideas necessary to give you an unequaled, up-to-date installation would be to visit certain other representative plants, picking the best you see in each to incorporate into your own. In fact, we believe that such visits are almost essential to getting the points you wish.

If you desire we can give you a list of representative plants in various lines of business that have points well worth investigating.

Nickel in Cast Iron

Q. What advantage is derived from nickel in cast iron? I have heard of nickel cast-iron, but do not find any data on it in the various handbooks.

A. The addition of nickel to cast iron is comparatively new. The chief object is to eliminate the hard chill in cast iron, and make thin castings more easily machinable. Incidentally, the addition of nickel to cast iron is claimed to produce a finer grain in the iron, and make a tougher and more resistant metal. Various other properties are claimed, and undoubtedly the field is open for an extended use of this alloy. The amount of nickel is usually not over two per cent. A large nickel company supplies nickel shot that can be added to the iron in the ladle in the desired proportions.

Preserving Shop Drawings

Q. We have a small contract shop where most of our jobs are done from sketches, or pencil drawings. We have had great difficulty in keeping drawings clean and readable when sent into the shop. We do not care to go to the expense of having the drawings copied or traced, and are anxious to know if you can suggest any cheap method of duplicating them.

A. An old method of preserving shop drawings is to paint them over with a heavy coating of shellac. The shellac is not soluble in oil, and the oils and greases accumulated on the drawing in the shop can be washed off readily. When alterations are to be made in the pencil drawing, it will be found that the shellac may be washed off of that part of the drawing with alcohol without affecting the pencil lines. After changing, the drawing is again coated with shellac. Many plants use the shellac method for tool work where the drawing is expected to be used only once, and the expense of tracing is not warranted.

Reforging Scrap Steel

Q. I understand that some shops have found it possible to rework scrap steel by forging. In the articles on salvage in the American Machinist *I have never noticed anything on this subject. Please let me know if this is practical, and if the reforged steel is fit for general use.*

A. Reforging, or hammer welding, of steel bar-ends, and steel scrap in general, is a process recommended only for isolated shops where new material has a high value and scrap steel has a low sale value. The British do it in Colonial shops, and it is practiced extensively in the large railroad shops in South America. The process is simple. The steel scrap, after sorting, is made into tight bundles of a size convenient for the furnace and hammer available. It is thoroughly soaked to a white forging-heat, and then worked into an ingot under the steam hammer. The steel reforged in this way is usually worked into bars for forgings. The railroad shops employ this reclaimed steel for the manufacture of a great variety of general parts.

Boring Glass Bottles

Q. We have ahead of us a production job of boring ⅜-in. holes through 25,000 one-gallon bottles. The bottles are of the common pressed glass variety with walls ½-in. thick. Will you kindly tell us the proper methods and tools to use?

A. A good method of drilling is to use a piece of copper tubing of the correct outside diameter for the hole required. The wall of the tubing for a ⅜-in. hole should be 1/16 in. thick or a little less. The tubing should be rotated in the spindle of a drill press.

Diamond dust, alundum, carborundum, or some other hard abrasive, mixed with oil, is fed from the tube. The abrasive mixture may be injected into the tube through a small hole near the top between cuttings. The tube and abrasive will cut a core out of the glass. Very little pressure is used, and we suggest that you experiment to find the best speed for cutting, which will probably be between 400 and 500 r.p.m. for this work. The time for cutting through ½ in. of glass should not be more than two minutes.

Technical Abstracts

Drill Testing

Customary practice in testing tool steels in the form of drills has been to make up tools ¼, ½ or 1 in. diam. The included angle at the point is 118 deg., the clearance angle of the point at the periphery 12 deg. and the helix angle of the drill 26 to 30 deg. The clearance angle is increased toward the center of the drill until the angle between the cutting edge and the end of the web is 135 deg. This tool form is readily secured by the use of drill grinding machines. Feeds and speeds are adjusted so that the tool endurance lies between 25 and 200 in. of cutting. For reliable data, at least 9 tests should be made and averaged, using the original and two regrindings on each of three drills. Jerome Strauss in *Transactions of the American Society for Steel Treating*, April, 1926, p. 571.

Group Payment

The success of group payment is by no means independent of the size of the groups. The smaller the group the better is the fellowship between the members but this may be carried too far. Groups composed of as many as 15 members work very smoothly and efficiently. However, on an assembly divided into 20 separate operations, each of which requires different tools, equipment and materials and each of which is dependent on one or more preceding operations, the group should consist of 20 men. The hardest task in organizing is the selection of a suitable man for group leader. If it is at all possible, he should be chosen from the men in the group. Not only is he sure to be more familiar with the details of the work, but the psychological effect on the men is better. The group leader should be reasonably familiar with the work; he should be something of an instructor; he should be able to give help and information to his men; he should be able to recognize what each individual is best fitted for and place him accordingly; he should be able to interpret drawings and manufacturing information correctly; he should have planning ability of a good order and should have a sense of responsibility. Last and most important he should be a leader of men who can inspire confidence and gain co-operation. Harold B. Maynard and G. J. Stegemerten in *Industrial Management*, March, 1926, p. 167.

Accidents Due to Falls

A mine explosion or a train wreck is given first-page notice, but when a fellow slips on a stairway or falls and is hurt, little attention is given to the incident. Yet one-fifth of all accidents happen as a result of falls due, in half the cases, to unsafe walkway surfaces. About fourteen thousand people in the United States lose their lives each year in falls, and during the last decade more people were killed by accidental falls than the total killed in all wars since the Revolution. One insurance company has estimated that the loss to the nation from such accidents totals $100,000,000 yearly.

Many safety engineers attribute slipping accidents to the carelessness of workmen, but conditions should be such that the employee can go about his normal duties without exercising abnormal care. A sign reading "Watch Your Step" is not enough; the hazard should be removed. There should be no slippery surfaces where workmen pass, no projecting switch-throws, no loose man-hole covers, no floor projections for persons to trip over, no stairways with low headroom, nor doors opening directly to stairs. Safety treads should be provided on stairs and walkways. Floyd W. Parsons in *Industrial Gas*, April, 1926, p. 5.

Optical Methods For Setting Work

Optical instruments have been used in the inspection of finished parts for several years and have been particularly satisfactory for this work. A line of instruments has been recently developed based on the same principle for use in setting up work and tools. These instruments enable the ordinary mechanic to make accurate set-ups with convenience, and must not be considered as laboratory tools. An example may be taken of lathe tools for threading. The accuracy of the setting and of the tool-point shape can be readily observed through a magnifying lens which is mounted directly over the gage "V" and magnifies four times. The magnifier is adjustable to suit the vision of the observer. If white paper is placed beneath the gage, errors of less than 0.0001 in. can be detected by light appearing between the tool and gage edges. When it is desirable to have the top of the tool point 0.001 in. or 0.002 in. above or below the axis of the work, such a setting can be made. After the setting of the tool has been completed, the instrument is removed before starting to cut the thread. The level vial is sensitive to 1 minute. Charles O. Herb in *Machinery*, April, 1926, p. 603.

Seam Welding

Two methods of producing ductile welds have been developed by research scientists of the General Electric Co. In one the two electrodes of the torch are tungsten rods, held at an acute angle with each other by lava insulators. When not in use the electrodes are in contact with each other; they can be separated by pressure on a lever mounted on the handle. A set screw is provided for making slow adjustments of the electrodes. Hydrogen is supplied by a tube through the handle. Sufficient gas is used so that not only are the electrode tips surrounded by enough to form the blast of atomic hydrogen, but by an additional quantity to surround the work.

A slight pressure of less than 1 lb. per sq.in. is sufficient with metals up to ½ in. in thickness. For ordinary welding, the rate of gas consumption varies between 20 and 30 cu.ft. per hour. Best results have been obtained when the torch is inclined so that the blast of hydrogen passes over the pool of molten metal in a direction opposite to that in which the torch is moved along the line of the weld.—*General Electric Review*, March, 1926.

American Machinist

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

Established 1877

An Anniversary

THIS month marks an unusual anniversary in "American Machinist" history. Just forty years ago Fred H. Colvin had his first article published in these pages.

Such a record falls to the lot of but few men. Who shall measure the extent to which his writings, both serious and humorous, have influenced the host of subscribers, and others, who have read the "American Machinist" in those two-score years?

His associates on the editorial and advertising staffs of the paper take this means of expressing their best wishes to Mr. Colvin and the hope that many more years of active writing lie ahead of him.

Better Lighting Increases Accuracy

VISION, or the recognition of an object or detail, may almost entirely be analysed into the discrimination of fine detail, of brightness-difference, and of color-difference. The minimum which we can distinguish in each case depends upon the intensity of illumination and the reflection-factor of the object or of its background. Therefore, other conditions being equal, our ability to see increases with the intensity of illumination. Furthermore, the speed or quickness with which we recognize what we are looking for increases with the intensity of illumination. Therefore, these are good reasons for increasing the amount of light used up to the most economic point.

How shall we know when this point is reached? It aids considerably in viewing the matter to know that the average intensity of illumination outdoors is a thousand times greater than that which is usually provided at our work-places indoors. Even on a "dark" cloudy day outdoors the intensity of illumination is usually a hundred times greater than the artificial lighting intensities generally provided indoors. Our eyes evolved outdoors and it is not surprising that they operate at their best at the high outdoor intensities.

All investigations of the phases of vision mentioned in the first paragraph indicate that we do not reach the best "seeing" conditions in general until we have illumination intensities far in excess of the few foot-candles at our work-places indoors. A recent investigation shows that accuracy increased 22 per cent when the intensity of illumination was increased from one to 20 foot-candles and there was no indication that the maximum accuracy had been reached. Many operations tax vision more than this particular one did so we may expect even greater increases in accuracy in many cases. Futhermore, accuracy is related to quality and quantity of finished products. From this, as well as other angles, lighting is very important.

Getting What You Pay For

QUALITY guaranties have been suggested through the Bureau of Standards and the American Engineering Standards Committee are considering both the feasibility and desirability of the proposition. It is felt that with a nationally recognized specification, or standard, placed in mass production and the products marked with a label guaranteeing their accuracy and quality, the user could be assured that he was getting just what he paid for in any given commodity.

While it is recognized that the conditions outlined are ideal and can be attained with but few commodities at present, it is looked upon as a goal toward which we may strive.

There is little doubt as to there being a field for products of second or third grade, in many industries. The difficulty is to know that you are getting the grade you desire, and pay for. If a system of specifications for graded qualities and workable guaranties could be established, it would save much uncertainty in the minds of purchasers and users.

Just how practicable such a plan may be remains to be seen. In too many cases guaranties mean very little either as a promise or on a label. Any method, however, that will tend to insure a customer getting what he pays for, be it first, second or third grade, is worth consideration.

Tangible Encouragement

EVIDENCE that the dreaded decline of business this spring has not materialized to any serious extent is found in two recent statements from authoritative sources. The annual questionnaire of the National Metal Trades Association brought out a predominance of replies that business is "Excellent" or "Very Good," a more favorable consensus than that of a year ago. The forecasts for the next six months were also more optimistic this time than were those of 1925.

From the National Machine Tool Builders' Association come barometric charts of machine tool orders that show a sharp upturn of the curve as compared with January and February.

Here we have two indicators, one based on opinion, the other on statistics, and both of them are optimistic. Is there any reason why we should not continue to be conservatively hopeful for the immediate future?

Shop Equipment News

Gisholt Turret Lathes, 3L and 4L

The two turret lathes shown in Figs. 1 and 2 are part of a line of ball bearing machines being manufactured by the Gisholt Machine Co., 1000 East Washington Ave., Madison, Wis. Fig. 1 is a view of the operating side of the 4L machine, which has a swing of 28 in., while Fig. 2 shows the 3L machine having a 21-in. swing.

Two types of each size are available, one with a fixed-center turret and the other having a cross-feeding turret. Both types have a full-swing side carriage with a square turret tool post. They are adapted for the general range of production work. The cross-feeding turret is designed to make the machine especially adaptable for small-lot tool-room, die and railroad work, since it permits the use of simple tooling and can be quickly set up. Short, stiff toolholders with forged tools may be used for facing and boring in place of the facing heads and double-end boring cutters required where the cross-feeding feature is not available.

The machines have been designed with ball bearings on all shafts transmitting power, and ball thrust bearings for the main spindle and feed nuts. They are equipped with alloy-steel, heat-treated gears and have multi-disk friction clutches and brakes. Each carriage is provided with independent feeds and unit assembly of the feed mechanisms. Rapid power traverse independent of the feeds is also furnished to each carriage. The machines have automatic feed and traverse trips, and micrometer dials with observation stops. A single lever is used to operate the double-bevel turret clamp ring and the index bolt. The machines have forged steel spindles with bronze bearing boxes that are tapered in the housings for adjustment from the outside.

Where a motor-drive is desired, the motor is set on a plate above the headstock. The motor base is hinged so as to swing back and give access to the headstock without removing the motor. For the 3L machine a 15-hp., 1,200-r.p.m. motor is recommended. The motor carries a pulley which is connected through a 5-in. belt to the 18-in. driving pulley rotating at 500 r.p.m. On the 4L machine the drive is through a 10-in. belt from a 25-hp., 1,200-r.p.m. motor to an 18-in. single pulley rotating at 450 r.p.m. The driving pulleys on both machines and the motor pulley on the 4L machine have an outboard ball bearing and are inclosed for safety.

As can be seen in Figs. 1 and 2, a heavy cast-iron pan supports the machine and serves as a sub-base or foundation. It is constructed to provide a series of chambers that have ribs running transversely and lengthwise to add to the rigidity of the construction. The chambers along the edge of the pan are covered with heavy perforated sheet steel secured by means of countersunk screws. The sheets are supported by means of bosses projecting from the bottom of each chamber and spaced at sufficiently close intervals so that a casting dropped on the sheets or a shovel removing chips will not injure them. As the coolant falls from the tools upon the sheets, it is strained at once and then drained back through the chambers to the central reservoir without accumulating in the pan.

The machine bed itself is a heavy box section ribbed laterally every twelve inches. A center rib also cast in the bed extends up under the headstock. Wide flat ways are provided on both the front and back of the machine and an under-cut way in a low position on the front of the machine supports the aprons of the side carriage.

The headstock unit consists of a drive shaft carrying a double multi-disk friction clutch and multi-disk brake, an intermediate shaft with the necessary gearing and the headstock spindle which carries the two driving gears, one on either side and close up to the front bearing.

The drive shaft and the inter-

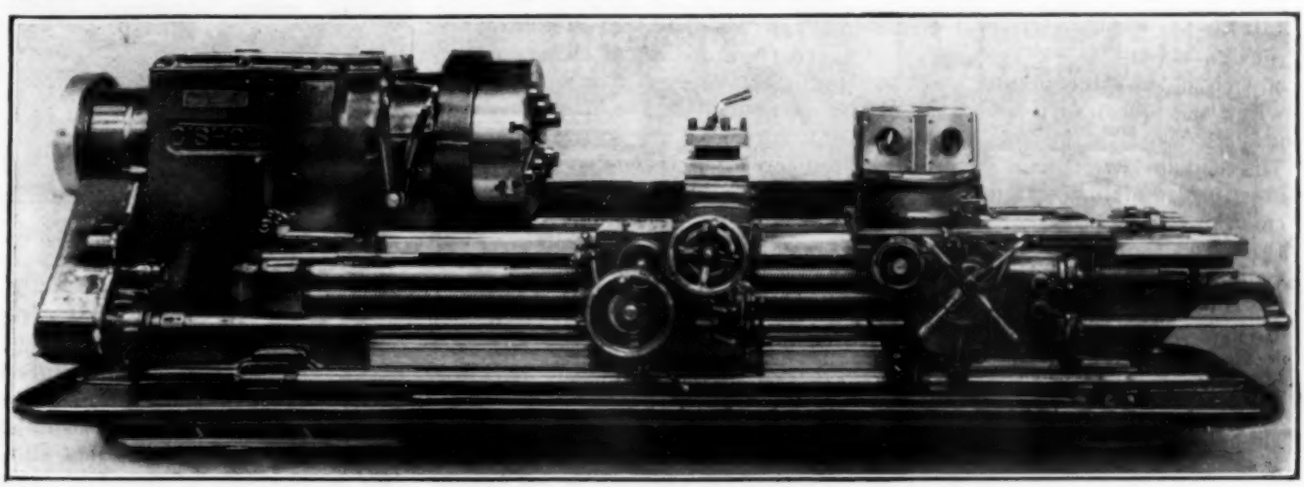


Fig. 1—Gisholt Turret Lathe, 4L

Shop Equipment News

mediate shaft are carried in annular ball bearings and the spindle is held in bronze sleeve bearings tapered on the outside for adjustment. The collars for adjusting the tapered spindle bearings have gear teeth cut on their circumferences to mesh with a gear

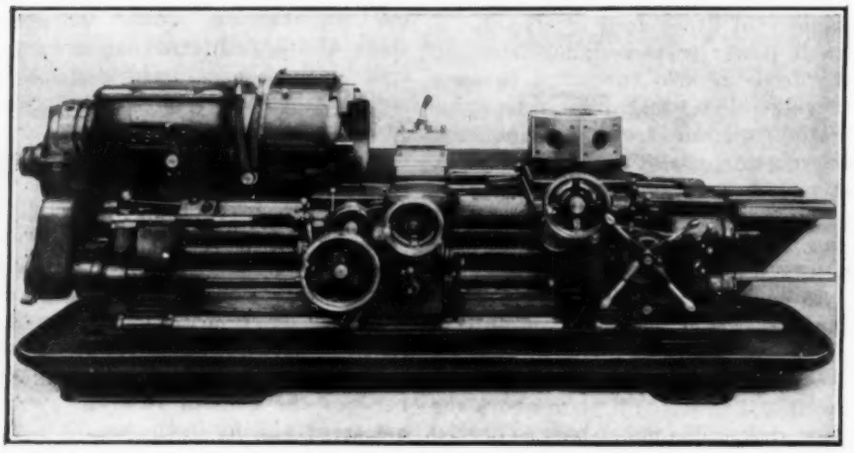


Fig. 2—Gisholt Turret Lathe, 3L

segment operated by means of the wrench provided with the machine. This segment is cut about a hole as a center, into which a sliding pin held in a boss on the front of the headstock is inserted. The pin acts as a fulcrum in adjusting the bearing for high-speed work or for heavy cuts. This adjustment can be made from the front of the machine without raising the cover of the headstock. The large ball bearing for taking the thrust of the spindle is located just back of the chuck gear.

Eight changes in the speed of the spindle are provided. They range from 8 to 257 r.p.m. in geometric progression. The entire headstock runs in a bath of oil and a special oil well supplies the spindle bearings with the lubricant. The chuck gear is keyed to the spindle flange. The spindle itself has a threaded nose for receiving various types of chucks and fixtures. Behind this thread on the spindle is a taper for centralizing the fixtures or chucks and for allowing them to be attached with a metal-to-metal fit. Depending on the speed desired, the double multi-disk friction clutch on the back shaft can be thrown to either side when starting. When it stands in neutral, the multi-disk brake is simultaneously engaged. In both the clutch and the brake mechanisms, the disks are made alternately from soft steel and phosphor-bronze.

The feed train is carried from the spindle on a series of ball bearing shafts to the feed shaft. A separate lead screw is provided for each carriage. This screw revolves only when driven by the rapid traverse mechanism. When the carriage is feeding, the lead screw stands still and the feed shaft, through a ball bearing gear train in the apron rotates the nut about the lead screw. When the rapid traverse is engaged, the lead screw runs ahead of or in the opposite direction to the feed, which is still operative at the end of the traverse unless it has been disengaged.

Eight reversible feed changes are provided in each apron, and additional feeds may be secured by pick-off gears in the headstock end. Feeds from 1/256 to ½ in. per rev., and all standard threads, are secured from one set of change gears, and special gears may be provided when required. The handwheels on both carriages are so geared to the lead screw nut through a differential gear that one revolution of the handwheel moves the carriage 1 in. When thread chasing, the wheel is locked by means of a plunger pin which facilitates the catching of the thread at each pass. An observation dial for the longitudinal feed is located on each carriage, graduated and geared to show 7 in. of circumferential movement for each 1 in. of carriage travel, and several adjustable clips are provided on the beveled circumference to act as observation stops. In addition, both carriages are equipped with automatic feed trips, and the toolpost cross-feed dial is graduated in thousandths. The two aprons are duplicates as to internal parts, and the various mechanisms may be removed as units by removing the end plates or front plate. The lubrication of the differential gear is from a central reservoir in each apron.

The rapid traverse is at the rate of 40 deg. per minute for each carriage independent of the feeds, and the pilot wheel on the turret carriage is automatically locked from rotating when the rapid traverse is engaged. The rapid traverse mechanism is mounted as a unit in the rear of the headstock, and is belt-driven direct from the drive pulley.

Four automatic longitudinal trips are provided for the toolpost carriage, which can be seen in Fig. 3. Six longitudinal trips for the turret carriage, which can be seen in Fig. 4, are provided, as well as an automatic trip for the cross feed.

The stop rod for the longitudinal feed of the square turret is graduated in inches and is mounted on an arm that can be swung out of the way when it is desired to have the

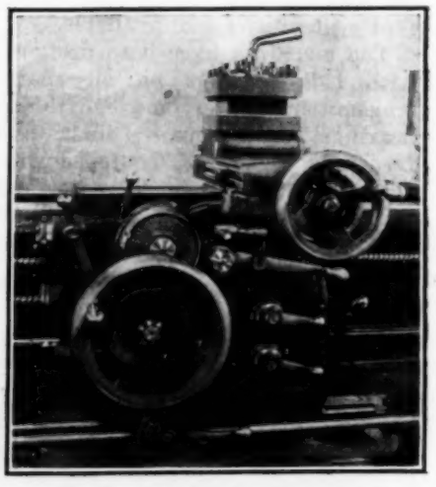


Fig. 3—Detail of the toolpost carriage

square turret side carriage pass the chuck.

The base of the hexagon turret has a beveled flange with a 12-deg. taper corresponding to a similar taper on the top of the carriage slide. The two sections of the clamp ring are beveled internally to match and

Shop Equipment News

are drawn together by an eccentric and lever having a mechanical advantage of 80 to 1, thus holding the turret against turning or lifting.

The six turret stop grooves are arranged in groups of three in separate heads. Each head can be moved quickly by withdrawing the

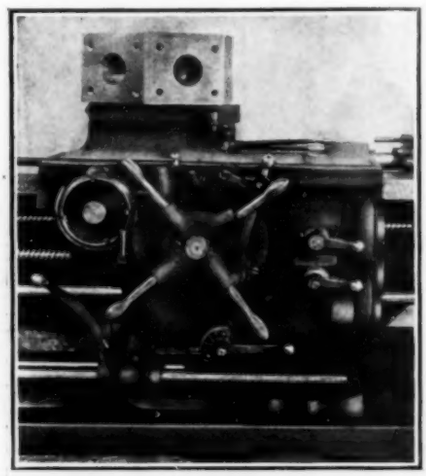


Fig. 4—Detail of the turret carriage

pin that positions it in one of a row of holes 1 in. apart, and fine adjustment of each stop is obtained by screwing it through the head. Coarse adjustment is made rapid by backing out a hollow head setscrew to which is attached a segment of a nut, thus permitting the stop to be slid through to about the point desired.

The taper attachment is of heavy construction and is attached to the rear of the bed. It will turn tapers up to a maximum of 6 in. taper per ft. in lengths of 15 in. On the fixed-center turret type of machine, the taper attachment is connected with the square turret on the side carriage. On the cross-feeding turret type, the taper attachment is connected with the cross-feeding turret unless otherwise desired.

These machines are regularly furnished with heavy steel body, three-jaw geared scroll chucks, but four-jaw independent chucks, air operated chucks or collet chucks are available. The bar feed can be furnished, and on the larger machine a power angular feed to the square turret toolpost for angles beyond the reach of the taper attachment. The net weight of the 3L machine is 11,000 lb., while 19,000 lb. is the net weight of the 4L machine.

Landis Portable Pipe-Threading Machine

To meet the need for a portable pipe-threading machine in the oil fields, the Landis Machine Co., Inc., Waynesboro, Pa., has brought out an equipment consisting of its 8-in. pipe-threading and cutting machine, and its chaser grinder, both mounted on a specially built trailer made by the Highway Trailer Co., Edgerton, Wisconsin.

The Landis 8-in. pipe-threading machine was previously described on page 1066, Vol. 63, of the *American Machinist*. It is equipped with all necessary chasers for cutting the various diameters, pitches and tapers on pipes and casings. The chaser grinder is mounted, without pedestal, on the front part of the trailer beside the tractor engine. It also has a small tool rest and a plain wheel, which can be used for miscellaneous grinding.

The grinder and threading machines are driven by a Fordson tractor mounted on the front part of the trailer and belted to the line shaft, which is supported along the lower

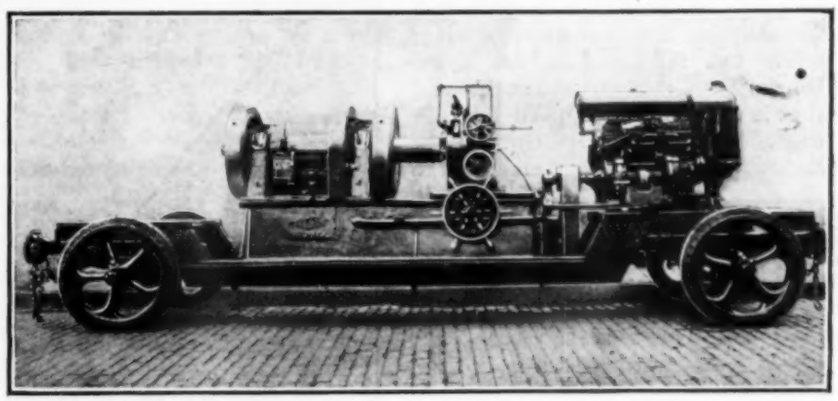


Fig. 1—Landis Portable Pipe-Threading Machine

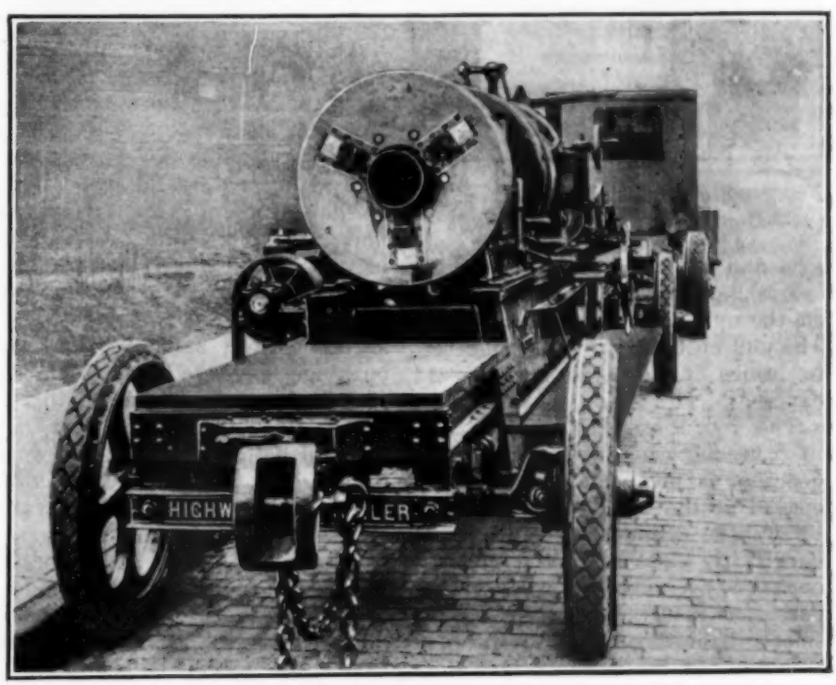


Fig. 2—End view of the portable pipe threader

Shop Equipment News

side of the trailer. Although the Landis portable threading and grinding equipment was designed for use in oil fields, it is also intended for maintenance work in large plants.

Stevens Tools for Fords

Two tools for facilitating repair work on Ford cars have been added to the line of "Speed-Up" tools manufactured by Stevens & Co., 375 Broadway, New York, N. Y. Fig. 1 shows a device for use in removing the Hyatt bearing assembly from the rear axle, while Fig. 2 shows a tool for splitting the cam shaft bearing.

The tool for removing the Hyatt bearing has a steel toe at its end that is hooked under the edge of the cage. By placing the end of the handscrew against the end of the

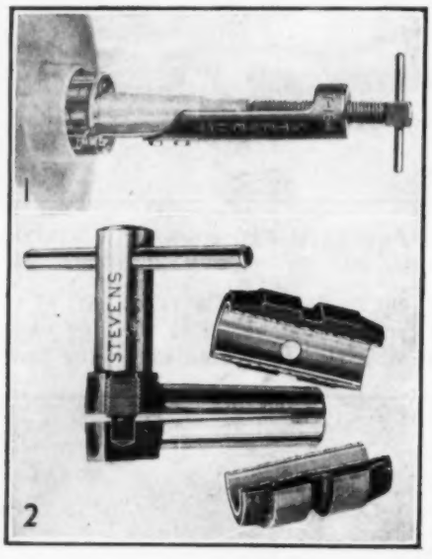


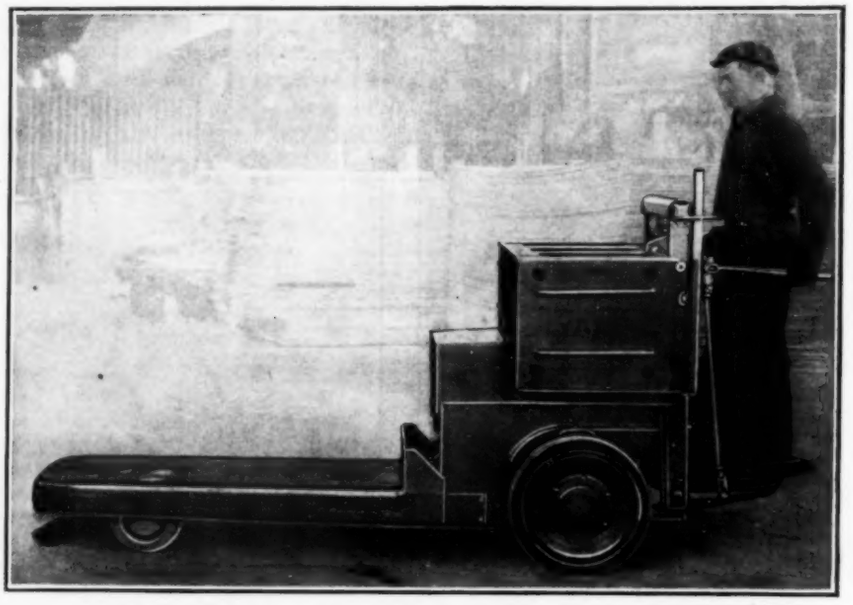
Fig. 1—Stevens Bearing Tool. Fig. 2 —Device for splitting bearings

axle and by turning the screw, the operator can readily pull the bearing off the axle and out of the housing. The pull on the cage is not sufficient to injure it. The tool weighs 14 ounces.

The tool for splitting the camshaft bearing consists of a split cylinder that is pivoted at one end and opened at the other by means of a screw. The cylinder fits the bearing bore fairly close so that a uniform outward pressure is exerted that does not result in damage to the smooth babbitt surface. A fraction of a turn of the handscrew is sufficient to split the babbitt lining. The device weighs one pound.

Yale Elevating-Platform Truck, K23E

The elevating-platform truck, Yale K23E, illustrated, is being marketed by the Yale & Towne Manufacturing Co., Stamford, Conn. The truck is similar to the low-platform truck, K23, described on page 348, Vol. 59, of the *American Machinist*, except that the elevating feature has been added.



Yale Elevating-Platform Truck, K23E

The truck is designed to carry heavy loads. The frame is made of heavy pressed-steel sections and the elevating mechanism is said to be amply proportioned. The truck is narrow in width and can turn on a short radius; because of these features it is claimed that it can be maneuvred in a box car or a narrow aisle. In order to make steering easy, the pivots are of hardened steel and turn in bronze bushings lubricated by a high pressure system. It is claimed that the load is well distributed over large tires on both front and rear wheels that will not flatten out under load

The triple spur-gear elevating mechanism is essentially the same as is used in the K22 trucks, described on page 230, Vol. 59, of the *American Machinist*, and the major replacement parts are interchangeable between the models. The elevating platform is raised by means of links connected to two large eccentrics mounted on the hoist unit shaft. The links draw the platform forward and upward. Safe operation of the lift mechanism is assured by upper and lower mechanical limit stops. The speed of elevation is said to be rapid.

The spur-geared unit power axle is a sub-assembly that is interchangeable with all other models of the "K" series. The gear shafts are mounted on ball bearings. The control mechanism is another sub-assembly that also is interchangeable with other trucks manufactured by this company.

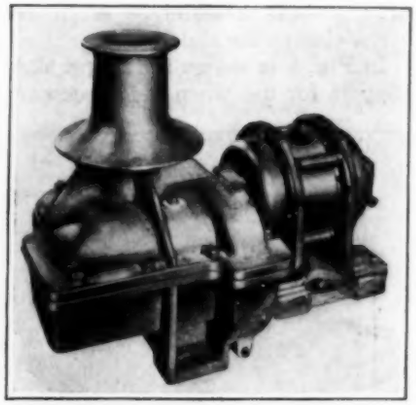
Caldwell Vertical-Capstan Car Spotter

A small, compact, motor driven car puller, or "spotter," has been put on the market by the H. W. Caldwell & Son Co., 1700 S. Western Ave., Chicago, Ill. The Caldwell "car spotter" is intended to reduce the time in moving and spotting cars. The machine is also found to be useful in moving materials in storage yards, foundries, or shops. The capstan has a full working radius of 360 deg., thus eliminating any relocating of the machine.

The car spotter is of rugged de-

Shop Equipment News

sign, with a heavy upper bearing to take the pressure from the rope pull. The capstan has a large flange on the lower end to reduce the bending moment of the shaft. The oiling system of the machine is automatic, and the gears operate in oil reservoirs. The machine is built in two sizes, No. 1 and No. 2. The No. 1 size



Caldwell Vertical-Capstan Car Spotter

has a speed up to 60 ft. per min., and will move up to three cars, while the No. 2 machine is designed for a speed up to 42 ft. per min., and will move up to six cars.

Horsburgh & Scott Worm Gear Speed Reducers

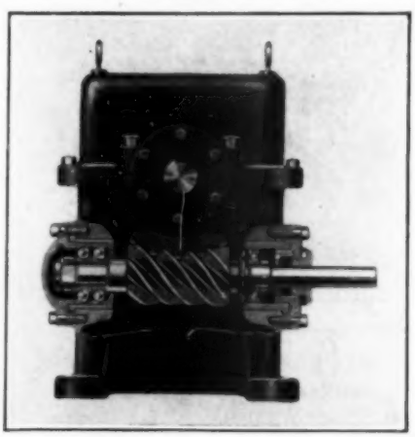
Three types of worm gear speed reducers have been placed on the market by the Horsburgh & Scott Co., Cleveland, Ohio. The type B which is shown in the accompanying illustration, has the worm below the gear; the type T has the worm above the gear and the type V reducer has the gear shaft in a vertical position. The single reduction units are intended for ratios up to 100 to 1. Double reduction units are also manufactured by the company for ratios up to 3,000 to 1 and over.

The worm is of the straight-body type and integral with its shaft. The worm and the shaft are a solid forging of low-carbon steel, carbonized, casehardened and ground. The worm threads are also ground. The worm shaft is mounted on ball bearings. The rear bearing is of the duplex radial-thrust type and the front bearing is of the straight radial type. The inner race of the latter bearing is fastened to the worm shaft and the outer race is free to float axially to allow for the expansion and contraction of the shaft.

In the smaller units the entire worm gear is of bronze and in the larger units a bronze gear ring is shrunk on a cast-iron center and secured by means of riveted steel pins. Three types of mounting are provided for the worm gear shaft.

Where the load on the shaft is principally torque, and is transmitted through flexible couplings or where an outboard bearing is used, lighter shafts mounted on ball bearings are furnished. Where the load is torque with a light suspended load, roller or journal bearings may be adopted, but heavy bronze journal bearings and large-diameter shafts are supplied for heavy overhung loads. Heavy external ribbing extends from the journal block to the base of the housing to insure rigidity and correct alignment.

The housing is a gray-iron casting. The upper part can be removed without disturbing either the worm or the gear alignment. The housing



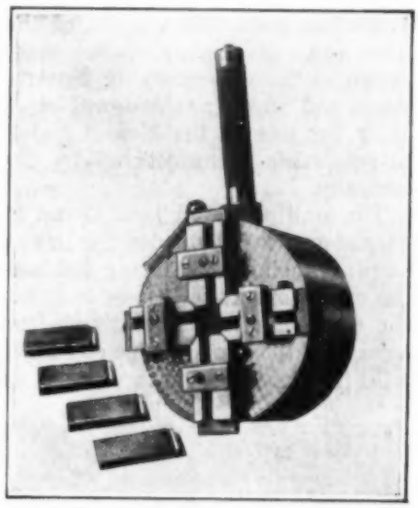
Horsburgh & Scott Worm Gear Speed Reducer

is sandblasted inside and out and is also coated inside with an oil-resisting compound. It is equipped with lifting rings and an oil filler pipe. The height of the latter determines the level to which the reservoir should be filled so that the level will not be maintained above the point where churning is likely to occur.

The point of contact between the worm and the gear is flood lubricated. Complete lubrication of the gear bearings is also provided for.

Darling Adjustable Diehead

The Bicknell-Thomas Co., Greenfield, Mass., has placed on the market an adjustable diehead, designed especially for the use of tap manufacturers, for tap threading. The



Darling Diehead for Threading Taps

head has four sliding jaws adapted to the use of inserted chasers, and it covers a range of tap sizes from ¼ to ⅝ in. in diameter.

The shoulder of the knurled handle which actuates the sliding jaws is made triangular in shape where it bears against the fixed stop in the body to regulate the size and by turning this handle to bring the different faces into contact with the stop the effective diameter cut by the chasers is altered.

By means of this arrangement a tap blank may be threaded in three successive operations: rough, semi-finish and finish cuts; thus insuring a smoothly finished thread and prolonging the life of the chasers.

Erratum

The description of the "Sickle" automatic universal cutter and reamer grinder published on page 616, Vol. 64, of the *American Machinist*, stated that 20 deg. was the lead or helix angle to which fluted tools could be sharpened. This is really the angle to which the sine bar can be swiveled and it will result in angles of 27 and 45 deg. for tools 4 and 8 in. in diam., respectively.

Shop Equipment News

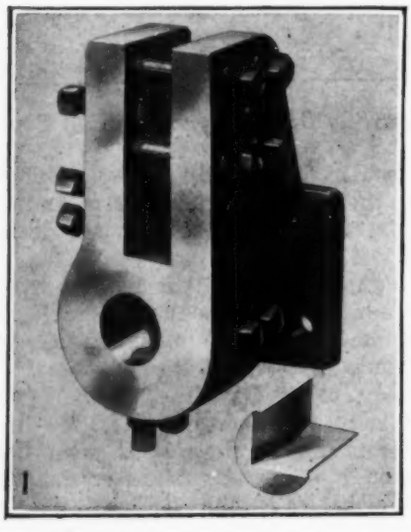
Warner & Swasey Universal Tools for Turret Lathes, Nos. 4 and 6

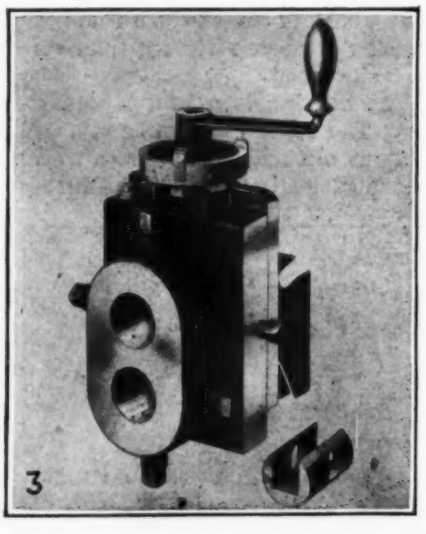
The Warner & Swasey Co., Cleveland, Ohio, has supplemented the line of turret lathe tools previously described on page 336, Vol. 64, of the *American Machinist*, with those shown in the accompanying illustrations, and which are designed especially for use on the Nos. 4 and 6 turret lathes manufactured by the company.

The multiple cutter head shown in Figs. 1 and 2 is intended for use in turning, facing, chamfering and boring operations at the same time that the cross-slide is also cutting. The head is of the vertical type so that it will not interfere with the cross-slide. Holes are provided for various combinations of setscrews so that each tool can be adjusted independently. Fig. 1 is a photograph of the head. Fig. 2 shows the use of the head with typical arrangements of the tools.

The head is made from a steel casting and is of a rigid design. The sides are held from springing apart when forged cutters are clamped in place, by means of tie screws and bushings. The tie screws can be shifted to allow for various positions of the cutters. A rocker bushing shown in Fig. 1 is provided for the center hole so that square-shanked forged boring cutters can be used in it. Four holding setscrews, one pair at right angles to the other, are provided for the center hole.

In Figs. 3 and 4 is shown the vertical slide tool. This tool is intended for recessing, back facing, boring, chamfering, and similar operations. Fig. 4 shows one set-up of the tool for back facing and another for boring and chamfering. The slide proper is supplied with a large micrometer dial for convenient and accurate resetting. Clips are provided which can be placed on any of the points at which it is desired to reset the tool. Forged cutters can be quickly set by the use of split bushings shown in Fig. 3. Two holding setscrews at right angles to each other are used to clamp the cutters. Boring bars can be used without the bushing. A taper gib compensates for wear and increases the rigidity of the slide assembly. A binder screw clamps the slide.





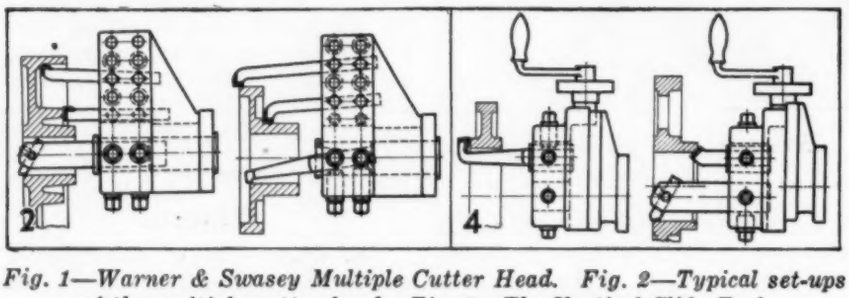


Fig. 1—Warner & Swasey Multiple Cutter Head. Fig. 2—Typical set-ups of the multiple cutter head. Fig. 3—The Vertical Slide Tool Fig. 4—Typical vertical slide tool set-ups

In Fig. 5 is shown the turret slide support for use when it is necessary to have an extreme overhang of the turret slide and where it is not possible to arrange any kind of piloting.

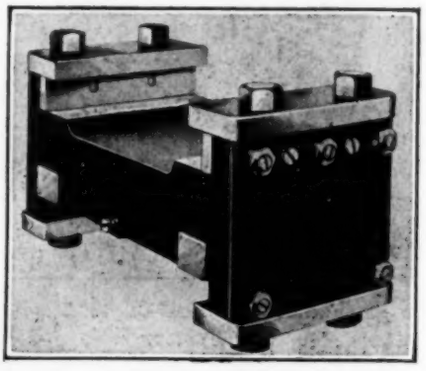


Fig. 5—The Turret Slide Support

The turret slide support is designed so that it can be clamped on the bed of the lathe between the cross-slide and the turret unit. The support is intended to permit the use of coarser feeds and to increase the rigidity of the slide. It is provided with both vertical and horizontal adjustments so as to allow the accurate setting of the support in relation to the slide, to compensate for wear.

Disston Inlaid High-Speed Steel Planer Knives

A high-speed steel is being used in the A-1 machine knives manufactured by Henry Disston & Sons, Inc., Philadelphia, Pa. This steel is used to give to the knives a cutting edge capable of standing up under heavy service.

The steel is being used also in the Disston "lock-weld" inlaid knives in which a section of the steel is inlaid in a carbon steel back. The thickness of the inlaid section is of the same degree over its entire length so that the knives can be reground as much as may be necessary.

Shop Equipment News

"Pfauter" Full-Automatic Hob-Sharpening Machine, Model FSS-A

The model FSS-A full-automatic hob-sharpening machine shown in the accompanying illustration, has been added to the line of Hermann Pfauter and is being marketed in this country by the O. Zernickow Co., 15 Park Row, New York, N. Y. Its design is based on the model FSS hob-sharpening machine previously described on page 1074, Vol. 63, of the *American Machinist*.

The machine is driven through a single pulley, either from a countershaft or from an individual motor. From this single pulley the drive is transmitted to the grinding wheel spindle of the machine and also to the table drive.

All movements of the machine are automatically controlled, including the reciprocation of the table, the indexing of the work from one flute to the next, the revolving of the hob according to the spiral of the flute and the setting of the hob to the grinding wheel after one complete revolution of the work. The reversing of the table is controlled by stops which can be set to give any desired length of travel back and forth, up to a distance of 17¾ in. The automatic setting of the hob to the grinding wheel is designed for the production of true running hobs in that a uniform amount of material is removed from all the teeth.

"Pfauter" Full-Automatic Hob-Sharpening Machine Model FSS-A

The indexing of the hob according to the number of flutes is accomplished by means of change gears. The lead of the spiral is obtained by means of an independent change gear system. If desired, the mechanism for automatically setting the hob to the grinding wheel can be regulated or disconnected in order to permit hand setting. The indexing can also be done by hand.

The machine is designed for handling tools with spiral flutes of any size up to 10⅝ in. in diam. and 13¾ in. in length, depending on the nature of the tool and the diameter of the grinding wheel. In addition to general tools with spiral flutes, such as reamers and profile cutters, the machine can be used for grinding work that has straight flutes. By means of a special attachment, face mills up to 13¾ in. in diam. may be sharpened.

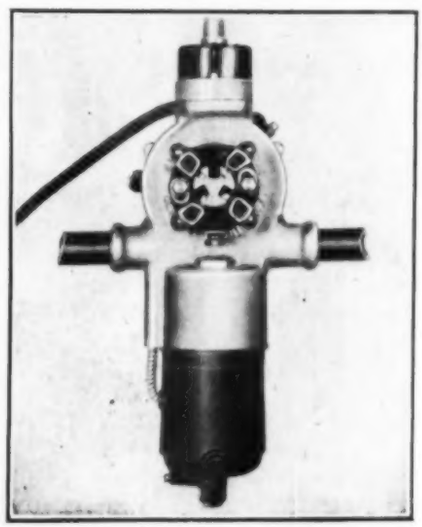
The worktable is mounted on a swivel base on the knee. The knee is carried on a screw for adjusting its height and it is steadied also by means of a guide pillar. It can be clamped in any position. At the back of the machine column is a second vertically adjustable support for grinding milling cutters. A hand rest is provided also for this table for ordinary tool grinding. The grinding spindle is hardened and ground and it runs in adjustable dustproof bearings of phosphor-bronze. A wheel-truing device is furnished with the machine. All gearing in the machine is inclosed and all movements of the machine are designed to be dustproof. The grinding dust is removed by means of a vacuum dust remover and is deposited in a water tank.

A 3-hp., 1,500-r.p.m. motor is recommended to drive the machine countershaft which rotates at about 800 r.p.m. The table can be swiveled 45 deg. in each direction and the table movement for one revolution of the spindle is 1 in. It can be adjusted 8⅞ in. vertically. The size of the table is 48x9⅞ in. The maximum diameter of the grinding wheel is 8 in. The floor space occupied by the machine is 67x71 in. and the net weight is 2,310 pounds.

Oster Electric Die-Stock

An electrically operated die-stock for threading ⅜-, ½-, and ¾-in. pipe has been developed by the Oster Manufacturing Co., Cleveland, Ohio.

The diehead is driven by a fully-inclosed universal motor that operates on either direct or alternating current of 110 volts, 25 to 60 cycles. An aluminum-alloy casing covers the motor and the gear reduction unit to the diehead. A separate diehead is used for each size of pipe and the change from one size to another is made by pulling out a pawl that holds the head to the ro-



Oster Electric Die-Stock

Shop Equipment News

tating sleeve. The dies are adjustable so that over and under-size threads can be cut as well as standard threads.

The tool is placed on the end of the pipe, which is held stationary, and is centered by means of a universal chuck instead of a loose bushing. This method is said to give proper alignment without loss of time, and the tool may be placed on the pipe without removing the burr from the cutting.

A switch is placed at the top of the tool. A quarter-turn of this switch starts the motor for cutting the thread, the next quarter-turn stops the motor, and the following quarter-turn reverses the motor and backs the dies off the thread.

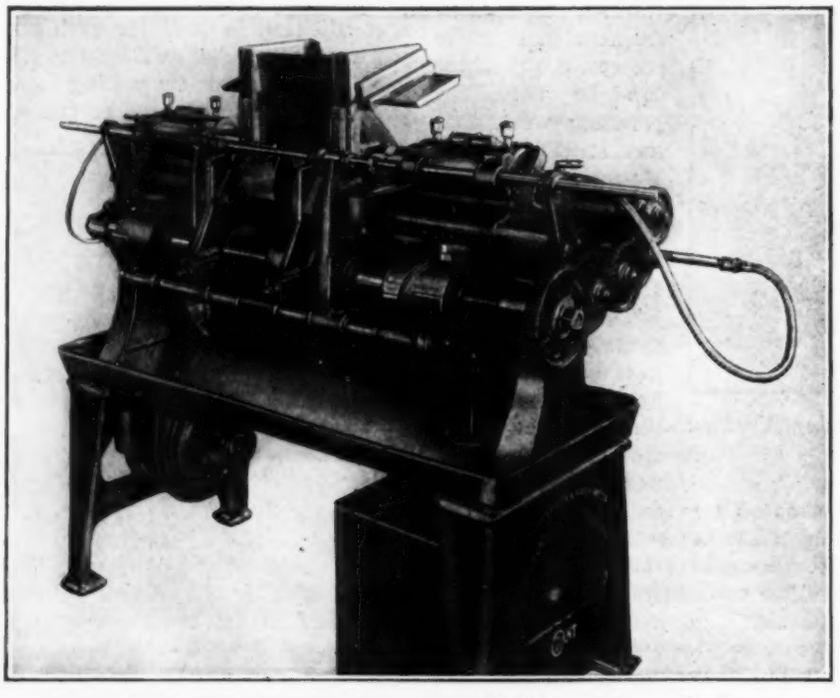
Grant Double-End Threading Machine Automatic

An automatic double-end threading machine arranged especially for hollow milling, facing and drilling both ends of sewing machine pitmans has been brought out by the Grant Manufacturing and Machine Co., 85 Sillman Ave., Bridgeport, Conn. The machine is a development based on a former model previously described on page 38, Vol. 62, of the *American Machinist*.

Like the former model, this machine has two independent and opposing heads which hold the various tools for performing the operations required on work up to ⅝ in. in diam. and 18 in. long. The heads are moved along the bed by means of two cams which may be seen in the accompanying illustration. The cams are carried on a shaft to which are fitted change gears for securing different pitches of thread. A second set of change gears provides for different rates of cycle movement and for long or short threads. The cycle movement has a removable handcrank to adjust the machine while setting up.

A magazine hopper at the center of the machine carries the rods upon which the operations are performed. The pieces are successively taken from the vertical guides into which they are carried to the two clamping jaws. The heads of the machine, carrying the tools, are then advanced by means of the cams previously mentioned and the piece is automatically ejected after machining.

The spindles of the machine are gear driven. They are hollow and through them the coolant for the tools is forced by means of a pump at the rear of the machine. As illustrated, the machine is driven from an individual motor through a chain, but a belt drive can also be provided.

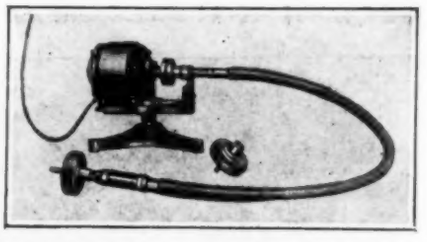


Grant Double-End Threading Machine, Automatic

Sirianni & Trumbettas Flexible Power Unit, No. 112

The flexible power unit, No. 112, illustrated is an improvement of the No. 3 unit made by the Sirianni & Trumbettas Manufacturing Co., Carbondale, Pa., and described on page 992, Vol. 63, of the *American Machinist*.

The equipment consists of a motor mounted on a special base, a flexible shaft, a grinding wheel and a buffing wheel. Various tools may be attached, including a drill. The motor base swivels on a tripod and can make a complete circuit. The flexible shaft is connected to the motor by means of a flexible coupling and the casing for the shaft is supported by a suitable bracket. The bracket may be reversed and the flexible shaft supported below the motor shaft extension for cone pulleys.



Sirianni & Trumbettas Flexible Power Unit, No. 112

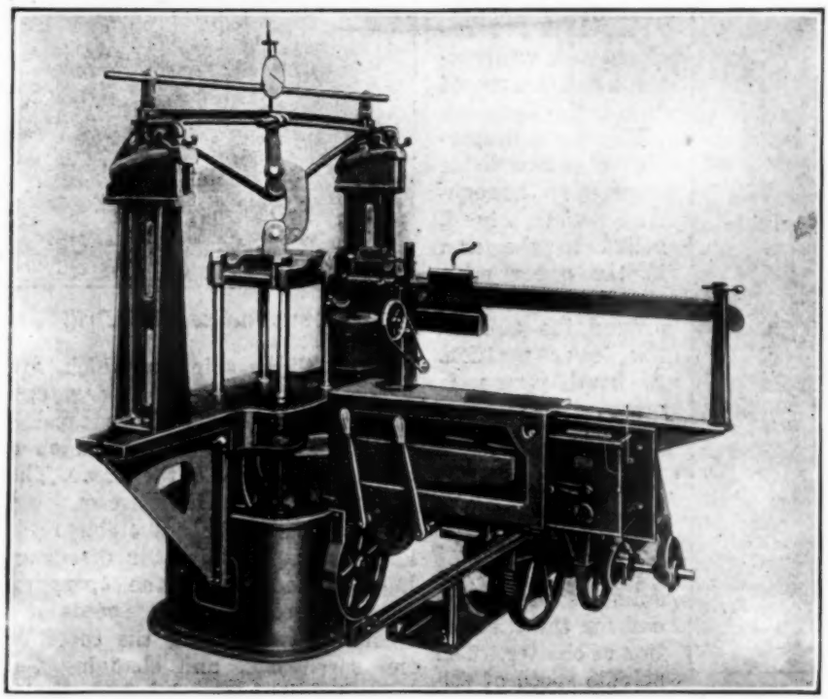
The core of the flexible shaft is ½ in. in diam. and is wound from hardened steel wire that is said to have great strength. The sheath is made of spiral-wound zinc-plated steel with an inner lining of flat coil steel that gives a smooth bearing surface to the revolving core. This construction permits higher speeds and it is claimed that the shaft may be run at 22,000 r.p.m. without heating. The shaft is fitted at the end with a ball-bearing handpiece.

Either a ¼- or ⅓-hp. motor can be supplied with the No. 112 unit. This size will drive an 8-in. grinding wheel or a ½-in. drill in steel.

Shop Equipment News

Olsen Brake-Beam Testing Machine

The brake-beam testing machine shown in the accompanying illustration has been added to the line of similar equipment manufactured by the Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa. The machine is similar in its principles of operation to the automatic and autographic universal testing machine described on page 652, Vol. 64, of the *American Machinist*.



Olsen Brake-Beam Testing Machine

A motor drive is provided and the power transmitted through gearing and shafts to the base of the machine. The crosshead is of the four-screw type and operates on the revolving-nut gear principle for applying the load. As can be seen in the photograph, the brake beam is mounted on the two columns of the machine. It is then connected by means of a large hook to the crosshead.

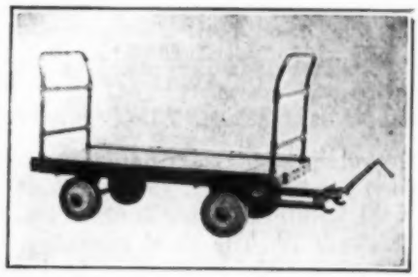
The load applied to the brake beam is balanced by means of the poise and scale beam to the right. The poise is moved along the beam by means of a long screw back of the scale. The screw is rotated by turning the small handwheel, which can be seen at the center of the photograph. The mechanism can be operated also by an individual motor. The automatic features previously described in connection with the universal testing machine can be applied.

It is built in two sizes for applying loads of 50,000 and 100,000 lb. The heights of the machines are 7½ ft., and 7 ft. 9 in., respectively. The floor space occupied is 84x80 in. and 90x80 in., respectively. Their weights are 4,250 and 5,750 pounds.

Crescent Trailer for Industrial Tractors

A trailer for use behind either gasoline or electric industrial tractors is being made by the Crescent Truck Co., Lebanon, Pennsylvania.

As can be seen in the illustration the truck has four wheels. Steering is accomplished by swinging the front axle about the "fifth wheel." The frame is built of T-iron girders braced with gussets at the corners. The wheels are semi-steel and are 12-in. in diam. They are provided with roller bearings lubricated by means of Alemite fittings. Bassick-type Ruboid wheels or solid-rubber, pressed on type tires can be supplied.

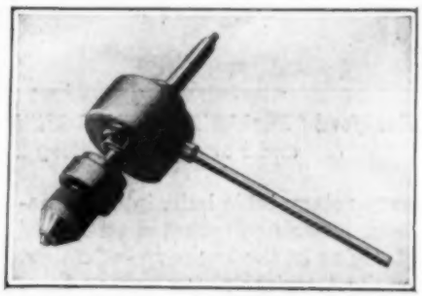


Crescent Trailer

The platform size is 3x6 ft. The height is 15½ in. above the ground. A set of pipe racks is standard equipment.

Bicknell-Thomas Tapping Attachment, Improved

The Bicknell-Thomas Co., Greenfield, Mass., has brought out its tapping attachment in an improved form. The shell is now made in one piece and is much heavier than the fabricated shell of the former model. The central driving gear, upon which devolves the duty of turning the tap, is now made with two substantial driving lugs, milled integral with the gear, instead of the two inserted pins as formerly.



Bicknell-Thomas Tapping Attachment, Improved

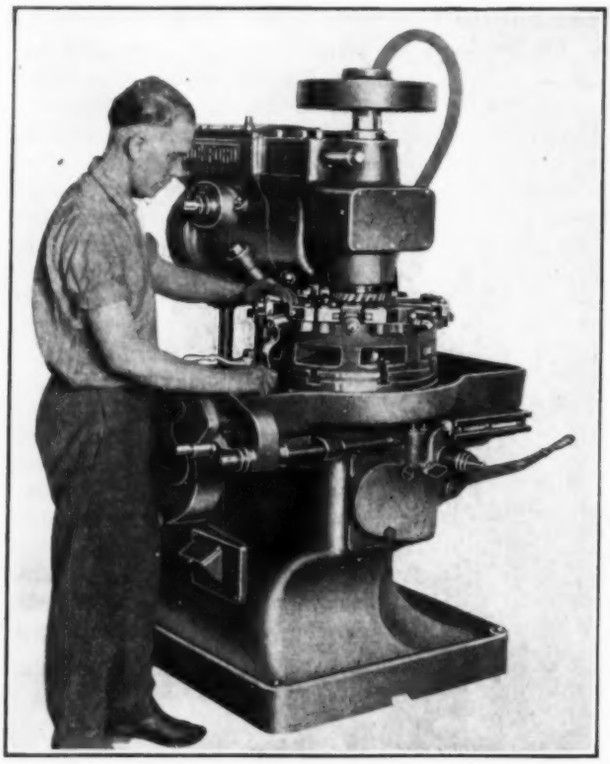
The driving dog is splined to the shank and is further strengthened by means of a pin that passes through the dog and shank. The spindle and all the gears are now made from nickel steel.

The attachment is made in three sizes: No. 1, to take taps up to ⅜ in.; the No. 2, for taps from ⅜ to ¾ in.; and the No. 3, for large taps up to 1⅛ in. in diam. They have plain or friction-drive chucks.

Shop Equipment News

Rockford "Rigidmil" Vertical Milling Attachment and Power-Feed Rotary Table

A rotary-table vertical milling machine has been placed on the market by the Rockford Milling Machine Co., Rockford, Ill. The chief advantage claimed for the machine is in the heavy rotary table built into the machine, instead of mounted on top of a table as in the knee-type of miller. On the "Rigidmil" the rotary table unit is mounted directly on the saddle slide.



Rockford "Rigidmill" Vertical Milling Attachment and Power-Feed Rotary Table

The drive is taken from the same gear that is regularly splined to receive the table screw. The worm for the feed is also driven from the same gear through a train of gears and a clutch. By changing the gears in the train a range of feeds can be obtained that will provide for the proper rate of table feed for the milling of parts of any size up to the diameter of the table.

The worm is provided with ball and thrust bearings, and the eccentric bronze bushings give adjustment for wear of the worm. The wormwheel is cast solid on the table, thus acting as a stiffening rib for the table. The table bearing is taken in three places, and scraped into position. The table is locked into position by a clamp which comes into firm contact with the gib on the saddle slide. The worm and wormwheel are enclosed in a compartment, and submerged in a bath of grease.

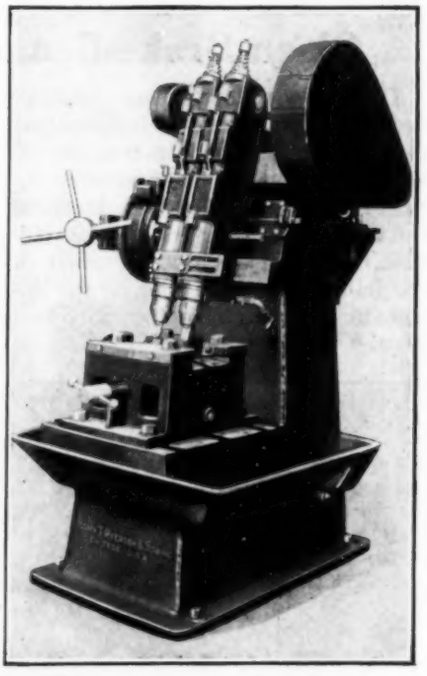
The vertical spindle attachment is mounted on the regular spindle head, bolted to the arm in the upper position, and clamped around the quill in the lower position. A bevel pinion is mounted on the regular machine spindle, and meshes with a gear on the spindle of the attachment. The attachment spindle has a flywheel splined to the upper end for the elimination of chatter. The spindle speed of the attachment is one-half that of the main spindle.

The diameter of the table is 17 in., and the maximum distance from the nose of the spindle to the top of the table is 9½ in. The maximum endwise adjustment with long bed is 18 inches.

Ryerson Inclined Rail Drill

An inclined rail drill has been placed on the market by Joseph T. Ryerson & Son, Inc., Chicago, Ill. The purpose of the machine, which is shown in the accompanying illustration, is to eliminate the handling and turning of heavy rails for the drilling operation in railroad reclamation shops. The rails can be left in the skidding position for drilling with the Ryerson drill.

The drill is ruggedly built. It has two or three spindles which are inclined at an angle of 15 deg., and are controlled by a single capstan wheel. The motor is carried on a bracket at the rear of the frame. The coolant pump and tank are enclosed in the frame. An adjustable feed-knockout is provided for disengaging the feed when the operation is completed. Spindle speeds are changed by removing the cover of the speed box, and changing the gears on the horizontal drive shaft. The drive shaft is connected to the motor by a silent chain.



Ryerson Inclined Rail Drill

Maxwell Drilling and Boring Tools—Correction

On page 655, Vol. 64, of the *American Machinist*, in describing the use of the "M-P" three-tool turret made by the Maxwell Products Co., 7513 Indiana Ave., Cleveland, Ohio, the misstatement was made that the tool could be used in a drill press; it is intended only for insertion in the tailstock of a lathe.

The "E-Z-Set" boring tool is made in three sizes. The tool bit size ranges from ⅜ to ⅞ in. in diam., the straight shank from ¾ to 1¼ in. in diam., the Morse taper shank from No. 2 to No. 4, and the B. & S. taper shank from No. 7 to No. 10. The shanks are separate units.

News of the Week

United States Losing Steel Rail Market in Japan Through High Prices

France and Belgium getting bulk of business

BY OUR TOKIO CORRESPONDENT

American steel rails are steadily losing their Japanese markets due, in part, to production in Japanese factories. Other factors are the cheapness of the French and Belgian products, and the fact that Japanese officials do not care for steel rails of high carbon content. Rails purchased by the Imperial Government Railways from the United States in the year 1925 amounted to only 150 tons, compared to 37,000 tons during 1923. Purchases from Europe during 1925 amounted to 11,500 tons as compared with only 5,000 tons in 1923.

Figures of the South Manchuria Railway show similar losses for America and gains for France and Belgium. Last year neither system purchased any rails from England. While data regarding purchases of rails by private roads are not available, indications point to a marked diminution in demand for the American product.

AMERICAN RAILS WEAR LONGEST

On March 8, the Imperial Government Railways placed an order with the United States Steel Products Co. for approximately 6,000 tons of 100-lb. American open-hearth rails and oil-quenched splice bars for prompt delivery, in spite of the fact that previous press dispatches had indicated that a prejudice existed against American rails.

It seems quite probable that rails from the United States will continue in demand for heavy traffic stretches in and around Tokyo, Yokohama, Kobe and Osaka, where wearing value is demanded. The order of March 8 was for such use. Whether American rails will be purchased for the more general needs of the system depends largely, however, on the recovery of the exchanges of competing European countries.

According to a report made by Mr. Uyemura for the Imperial Railways, the rails which were manufactured by the Carnegie Steel Co. between 1898 and 1907 wore only a few years. These rails were of acidic Bessemer steel. Their failure was due to defects in manufacturing as well as to the fact that their proportions of carbon and phosphorus content were too large for this zone. However, Mr. Uyemura states that rails recently manufactured in America of open hearth steel are a great improvement over the former rails, though their value, as tested by actual conditions of use, is still unknown. The axle load on the Japanese railways is light, and the preference is for a low carbon steel such as is furnished by the European manufacturers. For many years the products of the Government Steel Works at Edamitsu, Kyushu, were subjected to a great deal of criticism, but are now felt to be about equal to the European rails.

Japan, since the war, has increased the capacity of her mills. At the present time, the demand for steel rails in the Empire runs to approximately 80,000 tons a year and nearly 60,000 of this is supplied at home.

PRICE ALONE DECIDES

Mr. Kakehi, chief of the audit bureau of the Imperial Railways, summed the whole matter up decisively as follows: "We do business on the supposition that insofar as quality is concerned the rails from the different manufacturers are exactly the same. As matters actually stand, price alone decides. Unfortunately for the American manufacturers, their quotations have been the highest for reasons stated, and their business has accordingly declined. If in the future the value of the yen continues to rise against the dollar, and the currencies of European countries stage a recovery, American rails will certainly re-enter the Japanese market at no disadvantage.

Such is the situation at present. American manufacturers are competing against Europe for the 20,000-ton annual business of Japan. As domestic production increases the total of orders placed abroad will decline. But domestic production is largely dependent upon conditions in Manchuria, from which the Empire's raw materials are principally drawn. At present these are bad. The possibility of a tariff war with India, which buys Japan's cotton goods and sells her Bengal pig iron, is a further complication.

Analysis Shows Gain in Skilled Labor

Our gain in population through immigration under the 2 per cent quota act of 1924 continues at a decreasing rate, according to immigration statistics for the first seven months of the second year under the operation of the new law. But the trends in migration noticeable during the first year under the new law, while continuing in the second year, show a number of interesting changes, according to an analysis made by the National Industrial Conference Board.

The net loss in common labor repeated itself, but was cut by more than half. Alien common laborers admitted from July 1, 1924, to Jan. 31, 1925, totaled 15,596, while 36,841 of this class emigrated during the same period, leaving a net loss of 21,245 for the seven months. From July 1, 1925, to Jan. 31, 1926, 15.378 common laborers entered, but only 24,175 left the country, reducing the net loss for the corresponding seven months period to 8,797. Alien skilled labor came and went in slightly larger numbers during the 1925-26 period than in the same period of the preceding year, and shows a slight gain in "net immigration," which rose from 22,775 in 1924-25 to 23,660 for the corresponding seven months period in 1925-26. Obviously, according to the analysis, we are gaining skilled labor and losing unskilled labor.

New Commerce Office Opened in Barcelonia

The formal opening of a new foreign office of the Department of Commerce at Barcelona, Spain, in charge of trade commissioner J. G. Burke, was announced last week by Dr. Julius Klein, director, Bureau of Foreign and Domestic Commerce.

FORTY-TWO STATIONS

In announcing this newest addition to the number of foreign outposts of the Commerce Department, Dr. Klein pointed to the fact that the Barcelona office will raise the number of such fields stations to a total of forty-two, located in thirty-four different countries of the world. This is a striking contrast to the situation which obtained twenty years ago when the Department of Commerce commenced its foreign service with four itinerant trade commissioners, destined to be the precursors of the system of 300 trade representatives who today are acting in the interest of American trade promotion the world over, and function in close collaboration with the consular service.

The selection of Barcelona as the location for the new post is particularly advisable when it is considered that the industrial activity of Spain is largely centered in that city whose population numbers more than a million and which is second only to Madrid in size. The region surrounding Barcelona is highly industrialized and well supplied with hydro-electric power while the city has good rail connections with all parts of the peninsula.

Modern Design and Practice in Welding Featured at Annual Meeting

Propose investigation in field of steel fabrication

Several important contributions to present knowledge of practical welding problems were made through the discussion and demonstrations given at the annual meeting of the American Welding Society held in the Engineering Societies Building, New York, for three days last week—April 21, 22 and 23. The meeting was very successful in its purpose in that it covered quite completely the various phases of welding and the uses of gases as seen in present day practice.

Other features were a review of progress in gas and arc welding, a general symposium on the subject of design, an inspection trip to the plant of the Metal and Thermit Corporation, a discussion of research problems by the American bureau of welding and a dinner dance preceded by a spectacular demonstration of the properties of liquid oxygen.

New officers for the ensuing year were elected as follows:

F. M. Farmer, president; E. M. T. Ryder, first vice-president; R. L. Brown, A. M. Candy and Stuart Plumley, divisional vice-presidents; C. A. Adams, H. M. Hobart, A. E. Gaynor and A. G. Bissell, directors at large.

On Wednesday morning there was held a well-attended meeting of the Gas Welding Committee, of which S. W. Miller, head of the research laboratory of the Union Carbide and Carbon Corporation, is chairman.

At Mr. Miller's invitation, F. R. Low and C. W. Obert, chairman and secretary respectively of the A.S.M.E. Boiler Code Committee, spoke briefly on the "Unfired Pressure Vessel Code" and the attitude of the code committee on welding. It was pointed out that the committee has no actual authority in matters of construction. Its function was rather to crystallize and codify the best existing practice.

Two German engineers, Dr. K. P. Berthold, chief engineer of I. G. Farbenindustrie Aktiengesellschaft, and Dr. H. H. Max Füchsel, chairman of the welding committee of the V. D. I. (German Engineers Society), conveyed the greetings of their colleagues and told of German practice in the matter of testing welds.

A report from the San Francisco section outlined the preliminary program for research on the strength of welds at high temperatures. This work, in which Leland Stanford University and the University of California are cooperating, will be limited at the start to welds made with commercial welding rods on ordinary firebox steel.

The main feature of the meeting of the Electric Arc Welding Committee was a discussion of the results of tests made to determine the effect of such factors as current, size of electrodes, design of joints, positions of welding, etc., as presented by the subcommittee on the Fundamentals of Arc Welding.

This was preceded by a report of the subcommittee on non-ferrous metals. One member reported success in welding aluminum with the electric arc. Another told of the Niagara Power Co.'s practice in the matter of repairing eroded impellers of hydraulic turbines. These are renewed by arc welding with phosphor-bronze rods.

In a discussion of single-V versus double-V welds (in steel plate) several spoke in favor of the single-V weld as ample for many purposes. Samples were shown of square-end and single-V welds made with a grooved copper backing plate to give excess metal on the back side. The results of tests to determine the effects of size of electrodes, design of joints and other factors on the properties of electric arc welds were presented by H. L. Warner, of the General Electric Co. There was some disagreement as to the interpretation of the results obtained. The tests seemed to prove, among other things, that the single-V weld was as good as the double-V and that a V angle of 60 deg. was best.

There was much discussion of the reliability of welding, and it was generally agreed that a strength of 36,000 to 40,000 lb. could be absolutely depended upon with properly trained welders.

Power Plant Session

The papers at the Thursday afternoon session were of particular interest to power-plant engineers. That of L. J. Sforzini on "Design of Joints in Piping Installations," was a notable contribution to the literature of practical welding.

S. W. Miller of the Union Carbide and Carbon Research Laboratories, presented a paper on the "Design of Welded Joints with Special Reference to Pressure Vessels," while L. H. Burkhart illustrated design methods by the details of design and manufacture of a welded pressure vessel to meet specific requirements.

A paper of principal interest to tank and container manufacturers was that of A. C. Vick on "Gas Welded Longitudinal Seams for Stringent Requirements."

E. E. Thum, in a paper on the design of welded joints, outlined the general principles governing the making of satisfactory gas-welded joints.

Mr. Sforzini discussed in detail the design of piping installations, pointing out where welding should and should not be used.

The principal social feature of the annual meeting was a dinner dance held Thursday evening in the Rose Room of the Hotel Astor. There were short addresses by the incoming and outgoing presidents, and an interesting demonstration of the wonders of liquid oxygen. Among other things, mercury was frozen and used as a hammer to drive nails. A rubber ball was frozen so stiff that it cracked like glass when struck with a hammer. An egg was "boiled" hard by means of the liquid oxygen and then changed back to the soft condition.

The annual meeting of the American Bureau of Welding, which is the research department of the society, took place Friday morning, April 23. Prof. C. A. Adams stressed the importance of fundamental research in the welding field. Some fundamental problems needing investigation in the electric-arc, gas-welding pressure-vessels and structural welding field were outlined.

Two important investigations are being proposed; one in the field of unfired pressure vessels as a joint investigation with the A.S.M.E. to secure information needed by the Boiler Code Committee and designing engineers. The other investigation is being proposed in the field of fabrication of structural steel in which co-operation is being sought from the American Institute of Steel Construction.

A.S.M.E. Entertains Foreign Delegates

In connection with the meeting of the International Electrotechnical Commission a number of representatives of foreign standardization bodies met during the past week with American engineers interested in the same activity. A feature of the conference was the luncheon tendered to those gentlemen by the American Society of Mechanical Engineers at the Engineers' Club, on April 20.

Dr. William F. Durand, past president, A.S.M.E., made the address of welcome. Responses were made by Prof. Curt Hoenig, of the Swiss delegation, Dr. Otto Kienzle of Germany, and Domingo Santa Maria representing the Chilean National Committee.

Delegates were present from Austria, Belgium, Chile, Czechoslovakia, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Poland, Russia, Sweden and Switzerland. C. E. Skinner, Dr. P. G. Agnew and F. J. Schlink represented the American Engineering Standards Committeee. Also present were assistant secretaries of the A.S.M.E., S.A.E. and A.I.E.E., and editors of a number of technical magazines.

Southern Metal Trades Meeting at Macon

The ninth annual convention of the Southern Metal Trades Association will be held in the Hotel Dempsey, Macon, Georgia, May 5 and 6. An excellent program of addresses covering various topics of interest to manufacturers of metal products has been arranged. Among the more important subjects will be: "Foundry Management and Its Effect on Costs," by W. J. Barrett; "Refining Molten Cast Iron," by G. S. Evans, of the Mathieson Alkali Works, Chicago; "Modern Foundry and Machine Shop Construction," by C. A. Harwick, Southern manager of the H. K. Ferguson Co., of Birmingham. There will also be discussions of safety problems, labor conditions and the financial phases of manufacturing.

New Canadian Tariff Works Hardship on Manufacturers

One of the outstanding features of proposed changes in the Canadian tariff this year, as announced in the recent budget speech of Finance Minister Robb, is a reduction of 15 per cent on low priced automobiles. This reduction is on cars valued at not more than $1,200 retail (in the United States), and on motor trucks and motorcycles; while on automobiles valued at more than $1,200 retail (in the United States) the reduction in the general tariff is from 35 to 27½ per cent.

The Canadian duty is applied to the advertised retail price of the automobile in the United States, plus the United States sales tax of 5 per cent, so that the duty on a car valued at $1,000 retail in Detroit would be reckoned on the $1,000 plus the $50 sales tax, or on the total of $1,050.

To encourage the Canadian automobile industry, provision is made for a drawback of 25 per cent on materials used in the manufacture of the low-priced cars, provided that at least 50 per cent of the cost of the finished article is produced in Canada.

Machinery for use in producing unrefined oil or fertilizers from shale, has been put on the free list and exempted from the sales tax.

Aircraft engines and complete parts will enter Canada free under the British preference, and will be dutiable at 7½ per cent under the intermediate, and 10 per cent under the general tariff until July 1, 1928.

In announcing the cut in the duty on low-priced automobiles, the finance minister said: "There is a pronounced sentiment throughout Canada that the automobile industry enjoys more protection than is needed to maintain it on a reasonably profitable basis, and in deference to that sentiment we propose a downward readjustment of automobile, motor truck and motorcycle duties."

Among a number of the leading automobile manufacturers in the Dominion, the reduction in the tariff is regarded as disastrous to the industry. Their opinion is summed up in the following resolution, adopted at a meeting of the Automotive Industries of Canada, held in Toronto:

"It is the unanimous view of those present that the budget is disastrous to the industry and threatens both domestic and export trade. An analysis of the situation discloses the fact that the whole of the protection afforded to the automobile industry has been wiped out in one stroke, because the reduction of duties is greater than the margin that existed between the duties paid by the manufacturer on his material and that collected on the cars imported.

"The automotive industry finds itself today with the entire protection removed against the mass production of American factories and with an actual premium on imported cars."

T. A. Russell, president of the Canadian Automotive Industries Association, stated that a check-up of the manufacturers position showed him with the largest inventories and commitments, that are accumulated at any time of the year. "These have to be disposed of," he said, "and the factories will continue their operations until such stocks and commitments are liquidated, but many of them find that it will be imperative to begin transferring important parts of their operations from Canada, and increase their imports, both of motor cars and materials, from the United States."

As a consequence of the announced change in the tariff, the plant of General Motors Corporation, at Oshawa, Ontario, suspended operations for two days, while officials of the company considered the situation.

Pratt & Whitney Complete Plant Reorganization

The reorganization of the Pratt & Whitney Co., of Hartford, Conn., which started over six months ago is now practically complete and manufacturing is now being conducted according to the newly laid schedules. This reorganization covered not only the several plants of the company, but also the personnel of the engineering and sales forces.

In the rearrangement of the plant it was found possible to consolidate several departments. The buildings have been entirely renovated and painted a uniform color. A new lighting system has been installed, also new work benches, new inspection booths, modern washrooms with steel lockers and similar accessory equipment.

Old types of machinery and tools have been discarded and are being scrapped. In December and January twenty-six carloads of second-hand machinery were shipped out of the plant and three or four times this amount has actually been put into the scrap heap to be utilized in the cupola for new castings. To replace this old equipment modern up-to-date machinery is being installed in the various departments, all with a view to increasing efficiency and production.

The personnel of the new organization, which includes not only the machinery departments, but also the aircraft building plants, engineering departments and the sales organization, is made up of the following executives.

George J. Mead is vice-president and director of engineering work in the aircraft corporation; W. H. Weingar is manager of the gage division, one of the most important in the organization; Clayton R. Burt, is vice-president and general manager of the entire company; W. P. Kirk is sales manager of the entire division; David Ayr, who recently joined the company, will be factory manager; Fred B. Rentschler, president of the Pratt & Whitney Aircraft Corporation, will have direct supervision over that branch of the business; Frank O. Hoagland is in charge of engineering, designing and testing; Charles M. Pond is manager of the small tool department; A. H. d'Arcambal is manager of the small tool and gage divisions, and also consulting metallurgist for all divisions of the company.

14 Per Cent Increase in Machinery Exports

Exports of industrial machinery from the United States in 1925 totaled almost $150,000,000, which represents an increase of 14 per cent as compared with 1924. In fact, there has been a consistent increase in exports of industrial machinery from the United States since 1922, which was the low point following the post-armistice boom, and the volume of these exports is very much in excess of that of pre-war years.

Even allowing for increased prices the tonnage now being exported is in excess of the pre-war tonnage, while exports from Europe have not yet reached pre-war volume. In 1925 Great Britain purchased nearly $19,000,000 worth of machinery from the United States, and Germany took nearly $5,000,000 worth.

Since the stabilization of the mark German costs have been rising, and price competition has been less serious. Gradually abnormal conditions are disappearing, and as stability approaches American manufacturers are seen to have a position that is much more favorable than in pre-war years.

In Great Britain the unemployment situation has caused manufacturers to bend every effort toward securing export business, but in general the British business situation has been confused, and manufacturers there have found it exceedingly difficult to do business in non-British markets overseas.

For the past three years Latin America has absorbed a larger part of our machinery exports than has any other section of the world, and particular attention is called to the rapidity with which exports to Latin America have increased, this expansion being from $18,825,000 in 1913 to $52,433,000 in 1925. Latin America is now taking about 35 per cent of our machinery exports.

Shipments to Asia are also very significant. Contrasted with a value of about $4,000,000 in the pre-war period, the total is now approximately $16,500,000. But unlike the experience with Latin America, this volume is shrinking as the result of unsatisfactory conditions there and not because Asia has less need for industrial equipment than has Latin America.

In earlier years Italy did not rank high as a machinery market, but the amount of equipment shipped there has been growing rapidly, increasing from $559,000 in 1922 to $3,811,000 in 1925. Italy is being industrialized and water power properties in that area are being developed rapidly. The situation in Russia is particularly interesting, the volume of our industrial machinery absorbed expending from $64,000 in 1922 to $3,678,000 in 1925.

Canada is our best market for industrial machinery, and has long purchased between $20,000,000 and $30,000,000 worth of machinery from this country each normal year. Canada is rapidly being industrialized, lies very close to the United States, and is a market which deserves attention.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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IN THE pre-prohibition era the "gold cure" was often urged upon those who were addicted to drink. It frequently appeared to be effective, but America is now trying another gold cure of whose tonic effect there can be no doubt.

As predicted in these letters, the increase in the supply of monetary gold held in the United States has led the New York Federal Reserve Bank to reduce its rediscount rate to 3½ per cent. In anticipation of this action call money was freely obtainable last week at from 2½ to 4 per cent, and the result has been a sharp advance in the stock market with a revival of confidence in still higher prices.

It remains to be seen whether the busted boom can be put together again, but the belief that the Van Sweringens will make another attempt to consummate the Nickel Plate merger has greatly strengthened the market for rail stocks, and there are some indications that they will resume the advance when that was interrupted by the adverse action of the Interstate Commerce Commission some weeks ago.

The industrial securities have shared in the advance that has been led by the rails, but they are still somewhat under the influence of the slightly less optimistic reports of general business that found currency during the week. Judge Gary was somewhat less optimistic than usual in what he said at the annual meeting of the steel corporation, and the trade authorities seem to be almost unanimous in predicting a less active demand for iron and steel.

This view is confirmed by the slight decline at which orders are now being booked, as well as by the reports from the automobile trade, where there seems to be some difficulty in disposing of the large production that has been planned and is now being turned out. This difficulty is chiefly attributed to the slow demand for the used cars that are taken in part payment for the new machines that are bought. Various plans for solving the used car problem are under consideration, but none of them has been generally adopted as yet.

The price of copper, which has declined to 13¾ cents, is also construed as indicative of a lessened demand for a commodity that is an essential in constructive work, and the influence of the gold cure has not yet been extended to the other commodities.

In retail circles it is generally admitted that the abnormally cold spring has led people to procrastinate in the purchase of summer goods, and it is doubtful whether the trade so lost will be recovered.

But there is no denying that the change in the complexion of the stock market has greatly cheered those who deal in merchandise. The psychological depression that was so much talked of is no longer feared, and on the commodity exchanges there is a palpable revival of activity.

On last Wednesday cotton jumped up 40 points on reports of cold rains in Texas. Sugar is distinctly firmer because it is becoming plain that the Cuban government means business in its attempt to curtail production, and the grain markets are showing increased activity, although May wheat continues to disturb the trade by its erratic fluctuations.

The activity in building construction is still impressive, but there is a general agreement that rents are tending downward and that building promoters and contractors are in consequence more cautious.

Viewed inclusively, the outlook is upon the whole satisfactory, and the ship of business enterprise appears to be on an even keel. Its speed may be quickened later on if the trade winds freshen, but there is nothing to suggest the need of shortening sail at present.

In Europe the outlook is not so satisfactory, however. Great Britain appears to be drifting toward a coal strike that may be bitter and prolonged.

The French government is still temporizing with the financial situation. As a result French francs fell to below 3.30, but they recovered slightly upon the prospect that an agreement to fund the French debt to the United States would be shortly arrived at. The proposed settlement of the Italian debt has been confirmed by the United States Senate, but Mussolini's imperial aspirations are causing grave misgivings in many quarters and they add a factor of unsettlement to the European situation.

A reduction from 35 to 20 per cent in the Canadian duty on imported automobiles has led many of the American companies to shut down their Canadian plants. At this writing it is not known whether the shut-down will be permanent, but the stock of the Ford Motor Co. of Canada, which is actively dealt in on the Detroit Stock Exchange, has declined more than 100 points, and those investors who were induced to buy it at the high prices previously current are much discomfited.

The weekly statement of the Federal Reserve Banks shows a reserve ratio of 76 per cent, as compared with 73 a week ago. The New York bank in particular now has a reserve ratio of 88.3 as compared with 76.9 for the previous week and 79.9 per cent a year ago. These figures explain the cheapness of money and the reduction in the rediscount rate. It is upon this abundance of credit at low prices that the optimists base their predictions.

They may be right, but the losses incurred when the recent boom on the New York Stock Exchange collapsed are not yet forgotten and thoughtful men will await our foreign trade figures for April and May before subscribing unconditionally to the prophecies of a new boom that are now current.

What's Doing in Industry

There is little if any change in the trend of the machine tool and machinery market. Last week's report described conditions as "spotty" and that term aptly applies to the present market. New inquiries, especially those from railroads and public utilities, have strengthened the feeling that the second quarter of the year will show a substantial volume of business, although no gain is expected over the first quarter.

Reports from the important industrial centers show that business is not concentrated in any one district. Milwaukee reports the development of considerable new business, farm implement manufacturers buying for replacement purposes. Inquiries have increased in Chicago, but actual orders are scarce. Cincinnati reports a little more activity, with small individual orders making a substantial total volume.

The New England territory continues active, orders and new inquiries coming at a satisfactory rate. In New York, business is progressing at a normal pace, no large developments appearing in recent weeks. Philadelphia reports increased activity, but little in the way of new business. Detroit and Buffalo both report slowing up of orders, but no apprehension is felt when general industrial conditions in those cities are analyzed.

Viewed inclusively, the business outlook on the whole is satisfactory, and the ship of business enterprise appears to be on an even keel. There is nothing to suggest either a boom or a depression at the present time, or in the immediate future.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Detroit

Although the output of motor cars for the first three months of this year exceeded production of any similar period in the history of the automotive industry, the market for machine tools and machinery is at the lowest ebb of the year to date.

Rumors of changes in many of the plants, both in personnel and manufacturing methods and equipment are flying about thick and fast, but the more conservative representatives of machine tool builders are not too optimistic over business prospects for the next two months.

Some special machinery has been installed recently in Detroit plants, while there has been some call for standard tools. Automobile engineers are awaiting a loosening up of buying before going ahead with any extensive improvements.

Some observers seem to feel that Detroit's manufacturing establishments are tooled up better than they have ever been. The heavy buying which featured this market during the last few months of 1925 put practically every automobile plant on a heavy production basis and sales of machinery have fallen off as a result.

Outside of the Ford steel plant now under construction, the biggest single piece of machinery work being undertaken at this time is for the addition of the Oakland Motor Car Co. plant at Pontiac which will house the sheet-metal stamping and rear-axle housing departments. The plant is expected to be in production around the first of June. The building will be divided into three sections, a one-story crane bay section containing the larger presses, a one-story sheet-metal storage section, and a two-story section for light presses and stamping assembly.

Philadelphia

There was little change in the business situation among machinery and machine tool dealers and manufacturers this week compared to a week ago, when reports showed the business had experiencd a slackening compared to business in the corresponding months of 1925.

Reports that some establishments in the Philadelphia area had liquidated, throwing a considerable amount of equipment on the market, were a disquieting factor among some dealers and producers. While inquiries from industrial sources make their appearance frequently, few of these have developed into orders, and some the machine tool plants are operating within approximately 20 per cent of their capacity.

Reports from the used tool industry continue to show the business in this line to be better than it was a year ago. Dealers and manufacturers of smaller machinery find a considerable increase in volume, and engineers engaged in repairs claim a somewhat better outlook.

Cincinnati

The machine-tool market has become a little more active in the past week, according to reports of the majority of the Cincinnati manufacturers. In no case is a falling off in orders reported, and therefore the trade, taking it as a whole, has made a gain. While orders are to a great extent confined to single tools and replacements, there are enough to increase the aggregate.

Selling agents report an increased demand, which, though not at all large, shows that the business trend is still upward. General conditions are becoming more favorable, and because of this it is logical to expect a better market for machine tools to develop in the near future.

The bulk of the week's sales consisted of single tools, for replacement purposes, going to general machinists and industrial users. While a few concerns report a fair volume of sales in the automotive field, the buying from this field, taking it as a whole, has fallen off. A few orders from railroads are reported, but these do not include any large lists.

The past week's sales have been well scattered over the country and well diversified as to sizes and types of tools. Inquiries continue to come in freely from all parts of the country, for all kinds of tools, and this fact is regarded as a good indication. Optimism still prevails, and the general feeling is that the trend will continue upward.

Cleveland

The past ten days were a repetition of the first ten days of April. Business continues to be quiet and slow. No material change was evident. The few orders that were booked in the last fortnight were well scattered over different sections of the country and were mostly for small pieces and replacements.

Production continues to go on unabated, despite the slowing in the past month. A majority of the manufacturers are working night shifts, figuring that the present lull is only temporary.

Foreign inquiries have made their appearance and this has helped to keep up the tone of optimism which is prevalent at this time.

Milwaukee

While it is apparent that machine shops generally are not as free in placing orders for tool and other equipment as in recent months, and a greater degree of caution in making purchases is controlling business, the situation exhibits no characteristics that would arouse concern. There is a substantial volume of new business developing from week to week which is keeping manufacturers of tools well occupied at a capacity that still appears to be limited only by the ability to procure competent labor.

General industrial demand for production and toolroom machinery is not only as good as before, but gives evidence of broadening. Automobile shops, with a few conspicuous exceptions, are taking a breathing spell from a period of expansion of capacity that for many months kept the tool industry under high pressure. There is considerable replacement business from time to time, but only a few concerns are seeking greater capacity immediately.

The situation in the farm implement industry continues to improve, with the result that this group is becoming a more imposing figure in machine tool trade. On the other hand, it is true that the industry entered its present era of better business with an extent of capacity seemingly enormous in view of the slackness of its business for three to five years. Discarded machinery coming upon the used tool market is slow to move into new channels because of its obsolescent character.

Industrial construction as it relates to the metal-working trades in Milwaukee and vicinity is of moderate volume and it is considered significant of the stable condition in this field that while there has been a slight letdown in the number employed in textiles, shoes and other lines, the record of the iron, steel and machinery group remains eminently satisfactory and the scarcity of skilled machinists as well as foundry labor has not been relieved.

Chicago

The most encouraging phase of the machine tool market situation for the last week is found in the increasing number of inquiries which most dealers report. In the matter of closing sales, however, the same deliberation on the part of prospective buyers which has prevailed for a month or more continues.

With the occasional orders for small lots, mostly of new equipment, there has developed no demand of a stimulating tendency. Little is expected from the automotive industry for the present. Manufacturers of agricultural machinery are just now the principal buyers, the International Harvester Co. leading in point of orders placed, principally for punch presses.

Nothing of moment has recently developed with reference to railroad business, none of the outstanding lists having been reported closed. Dealers in used machinery are encouraged to believe that the increasingly large number of inquiries they are receiving presages a fair proportion of sales in the near future, but are not looking forward to any special activity for the remainder of April.

Buffalo

With the exception of the electrical equipment trade, machinery dealers report less activity at the present time than at any time since January first. Various reasons are advanced for this condition but it is significant that there is not much concern over the slackening of the demand and reports are united on the fact that most possible customers are very busy at the present time.

There is no pessimism and many hold the opinion that it is merely a brief and temporary reaction. However, it is interesting to note that some of the electrical equipment dealers are very busy.

The demand for contractors' equipment has fallen off somewhat, although this condition is not alarming and is due undoubtedly to the cold and backward spring. However, as soon as the weather gets warmer, a big business in contractors' equipment is expected.

New England

The volume of inquiries received in the New England territory during the past ten days has shown a decided increase and there was also a slight increase in the amount of orders placed. On the whole, both the business placed, and that in prospect, is said to be of the hand-to-mouth variety.

Buying has been largely of single units and, although much of it is for replacements, there were some indications that buying in some instances was for expansion purpose. Operations continue to be maintained at maximum normal rates.

Optimism prevails and with the first month of the second quarter about ended, managers are of the opinion that the business of the second period will surpass the total for the first three months.

Railroads have been buying in the New England section and the automotive trade is largely represented in the inquiry mail.

New York

Machinery business continues at a satisfactory rate in this market. New inquiries have added some activity to an otherwise desultory week and prospects now are bright for a good volume of sales in the month just ahead.

Railroads and large industrials are placing orders for single pieces. Repair shops of the New York Central, the D. L. & W. and one or two of the public utilities companies have bought several machines. The B.M.T. lines have issued an inquiry for a list of machines for the repair shops at Coney Island, which are in process of construction. This list numbers over forty machines.

A partial list of the machines ordered in the past week follows: Three shapers, 2 radial drills, 1 engine lathe, 2 heavy-duty drills, one 350-lb. and one 600-lb. steam hammer, 5 jig borers, 2 axle lathes, 2 vertical shapers, 3 automatic milling machines, one 72-in. boring and turning mill, 2 vertical drill presses, 2 vertical surface grinders, one 24-in. side-head boring mill and one profiling machine.

Business Men Will Discuss Self-Regulation Problems

Representatives of more than 1,400 business organizations located in every state in the Union have been invited to attend the annual meeting to be held in Washington, May 11 to 13, under the direction of the Chamber of Commerce of the United States.

The preliminary program shows that the questions to be considered are of importance to all branches of industry, finance and commerce. The major subject, around which all the discussions of the meeting will center, will be "Self-Regulation in Business." Prominently featured on the program are two additional subjects, namely, "Local and State Taxation and Budgeting," and "Relations of the States to the Federal Government."

High government and state officials and business men of national prominence will take part in the discussions.

With a view to facilitating the discussions, the conference will be divided into nine group meetings, each representing a particular branch of American business. These groups and the specific subjects they will deal with are as follows: Agriculture, civic development, domestic distribution, finance, foreign commerce, insurance, manufacture, natural resources and transportation.

Propose Safety Code for Traveling Cranes

The presentation and adoption of a safety code for the operation of electric overhead traveling cranes will be one of the features of the annual convention and steel exposition of the Association of Iron and Steel Electrical, Mechanical, Combustion and Safety Engineers, to be held at the Hotel Sherman, Chicago, June 7 to 10. Speakers on this subject will include: W. P. Potter, of the General Electric Co.; H. J. Payne, of the Society of Electrical Development; O. H. Needham, of the Westinghouse Electric and Manufacturing Co.; and D. C. Herschberger, of the railway section of that company.

Other subjects to be covered at the meetings are: Refractories for Steel Mills, Electric Heat in the Iron and Steel Industry, Standardized Mill Type Motors, and a series of descriptions of new steel plants.

S.A.E. Production Meeting at Chicago

This year's production engineering meeting of the Society of Automotive Engineers is scheduled for Sept. 21 to 23, at the Hotel Sherman, Chicago, and will be concurrent with the exposition of machine tools and heat treating equipment to be held by the American Society for Steel Treating. At the S.A.E. meeting there are to be sessions on factory conveyor systems and factory methods, automobile gears of all types, machine tools, and inspection methods.

Two or three visits of attending members to local factories will be arranged and there will be ample opportunity to inspect the exhibition.

Personals

P. C. PATERSON has been elected vice-president of the National Tube Co., of Pittsburgh.

ALEXANDER HARPER has been re-elected president of the Bristol Brass Corporation, of Bristol, Conn.

JOHN W. GRAY has been appointed works manager of the Fort Pitt Steel Castings Co., of McKeesport, Pa.

CALVIN W. RICE, secretary of the American Society of Mechanical Engineers, sailed for Europe on April 10.

W. C. PETERSON has been appointed metallurgical engineer with the Donner Steel Co., Inc., of Buffalo, N. Y.

FREDERICK B. HUFNAGEL has been elected president of the Crucible Steel Co., succeeding E. C. Collins, who recently resigned.

W. C. MACBAIN has been appointed general superintendent of the Porter-Cable Machine Co., of Syracuse, N. Y. He was formerly general foreman.

L. W. SCHNITZER has resigned as manager of the pneumatic tool department in the Chicago office of the Ingersoll-Rand Co.

G. W. MASON has been appointed general manager of the Copeland Products Co., of Detroit. He was formerly works manager for the Chrysler Corporation.

CHARLES H. CLARK has become associated with the Bridgeport Brass Co., of Bridgeport, Conn., as salesman in the raw material department. He will travel in Massachusetts, and also cover Providence and Meriden.

NORMAN K. MILLHOLLAND has become associated with W. K. Millholland in conducting the Millholland Sales and Engineering Co., of Indianapolis. He will take the place of R. A. Millholland, who recently resigned to become assistant general manager of the Cummins Engine Co., of Columbus, Ind.

JOHN FOGARTY, one of the organizers of the Keystone Foundry, at Elkhart, Ind., has leased the property for a term of years and will reopen the plant. The foundry has been idle for some months. It is reported that a large number of orders on hand will make it possible for the foundry to produce at capacity for several months.

Business Items

The Union Switch and Signal Co., of Garwood, N. J., has taken over the business of the Hall Switch and Signal Co.

The Rail Joint Co. has moved its New York office from 61 Broadway to 165 Broadway.

The Halcomb Steel Co., of Syracuse, N. Y., announces the removal of its New York office and warehouse from 401 Canal St. to Clarke and Dominick Sts.

The J. J. McCabe Lathe and Machinery Corporation has moved its offices from 149 Broadway, New York, to the warehouse in Jersey City, N. J.

The Luther Manufacturing Co., of Olean, N. Y., has purchased the Myrick Machine Co., of that city, and has merged the manufacturing facilities with its own concern.

The Robert June Engineering and Management Organization, of Detroit, has moved into new quarters at 2208 West Grand Boulevard, occupying the entire building.

The Cleveland office of the Niles Tool Works Division and of the Pratt & Whitney Division of the Niles-Bement-Pond Co., has been moved from West Superior Ave. to 1433 East 12th Street.

The Watson-Stillman Co., of New York, manufacturer of hydraulic machinery, has established a branch sales office at 7752 Duboise St., Detroit, Mich. Earle M. Porter has been appointed manager of this office.

Joseph T. Ryerson & Son Inc., of Chicago, have taken over the reinforcing bar division of the Penn Metal Co., of Boston. Manufacturing facilities will be extended and general sales offices have been established at 677 Concord Ave., Cambridge, Mass.

The Lindley-Dunning Manufacturing Co. has been organized with offices and plant in Germantown, Pa. Elmer D. Dunning, former vice-president and general manager of the Dunning Compressor Co. of Homesburg, Pa., is now associated with this company, and will have charge of the development of electric refrigeration pumps manufactured by the company.

The factory of the W. A. Ives Manufacturing Co, of Wallingford, Conn, manufacturer of augurs and bits, was destroyed by fire on April 20. The entire building, housing much valuable machinery, was burned and several other buildings in the immediate neighborhood were damaged. Carl J. Benham, president of the company, has been unable to account for the cause of the conflagration.

William H. Walther, superintendent of the Bradley & Hubbard Manufacturing Co., of Meriden, Conn., and Edgar B. Spencer, of Rocky Hill, Conn., are planning the organization of a new company, which is to start operations at Hartford, Conn., for the manufacture of gray iron castings. It is expected a foundry will be leased, equipped and ready for operations about May 15. Mr. Walther has severed his connection with the Bradley & Hubbard Co.

Obituaries

LOUIS R. LEMOINE chairman of the United States Cast Iron Pipe and Foundry Co., died at Villanova, Pa., on April 23.

CLAUDE JOHNSON, managing director of the Rolls-Royce Co., Ltd., died in London on April 11.

MAJOR ALBERT F. WALKER, for many years sales agent in Boston for the American Steel and Wire Co., of Worcester, Mass., died in Boston on April 22. He was 54 years old.

KEPPELE HALL, of Cleveland, well-known as an electrical and mechanical engineer, died suddenly in New York City on April 25. He was a member of the A.S.M.E. and of the Taylor Society.

JOSEPH F. JEWAR, vice-president of the Standard Metal Co., of Indianapolis, died recently at his home. Mr. Jewar was associated with the founding of the Standard Metal Co. in 1906.

BURTON PARKER, for several years manager of the export department of the Billings & Spencer Co. at Hartford, Conn., up to two years ago when he removed to Hackensack, N. J., died on April 19 in Hartford. He was 59 years old.

FRANCIS CURTIS SANFORD, inventor of the Sanford welding machine, the Sanford centerless grinder and numerous other mechanical tools, and the organizer of the F. C. Sanford Manufacturing Co., at Bridgeport, Conn., died at his home in Bridgeport on April 17. Death was sudden and due to a shock. He was sixty years old.

CHARLES LEONARD ROWLAND, mechanical engineer and inventor of a container for chlorine gas, died in New York City on April 18. Mr. Rowland founded the American Welding Co., at Carbondale, Pa., in 1908, and was president of the company until a few months ago when it was merged with the American Car and Foundry Co.

ROBERT J. RYAN, of Indianapolis, who died in a hospital at Thomasville, Ga., after a short illness, was buried in Indianapolis last week. Mr. Ryan had been branch manager at Atlanta, Ga., for E. C. Atkins & Co., saw manufacturers of Indianapolis. He made several trips to South America for A. C. Atkins & Co., before taking over the Atlanta branch.

Trade Catalogs

Ball Bearings. The Torrington Co., Torrington, Conn. This company has published two leaflets as well as a catalog and price list of Torrington ball bearings. The catalog gives a very full description of the manufacture, uses and maintenance of ball bearings. The differences of the various types are pointed out and illustrated. In addition to price and specification tables the booklet contains tables for determining load ratings and for inch and millimeter equivalents. Attached to the booklet are full-size scale drawings of the bearings manufactured by the company.

Boring Machines, Jig. The R. Y. Ferner Co., Investment Building, Washington, D. C. "The Economical and Accurate Production of Jigs and Fixtures" is the title of a booklet distributed by this company which is the United States agent for the Société Genevoise D'Instruments de Physique jig-boring machines. The construction and use of the machine are fully described and illustrated. Photographs of various classes of work and the time required to complete each job are included in the booklet which contains twenty-four, 8½x11-in. pages.

Broaching Machines. The J. N. Lapointe Co., New London, Conn., is distributing Catalog No. 35 on the Lapointe variable-speed hydraulic broaching machines. The operation of the machine is described as well as the construction of the Hele-Shaw variable-delivery hydraulic pump used in connection with the machine. Illustrations of the machine and the pump are included in the circular.

Circuit Breakers, Oil. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Special Publication No. 1643-A has been published by this company. The booklet contains thirty-two, 8½x10½-in. pages. It describes the general application of oil circuit breakers, the determination of short-circuit current and the precautions necessary. A number of pages of tables and charts as well as several photographs are included in the work. The style of the booklet conforms as a whole with the usual Westinghouse catalog design and it is well written and prepared. It will be found a valuable reference on oil circuit breakers in general.

Electrical Controllers. Allen-Bradley Co., 286 Greenfield Ave., Milwaukee, Wis. A large sectional catalog has been published by this company. The sections deal with d.c. manual starters, d.c. automatic starters, d.c. and a.c. mill and crane controllers, d.c. and a.c. rheostats, a.c. manual starters, a.c. automatic starters, battery-charging and testing equipment, and accessories. The sections are arranged for either a loose-leaf book or for the standard letter file. Index tabs are provided. The descriptions in each section are full and well illustrated and their general appearance is attractive.

Flexible Shaft Equipment. N. A. Strand & Co., 5001 North Lincoln St., Chicago, Ill., have prepared Booklet B on Strand flexible shafts and equipment. A brief description and photograph are given of each machine, and various types of tools and accessories are also illustrated and described.

Gears, Micarta. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. "Salient Facts on Silent Gears" is the title of a thirty-two page, 4x7-in. pamphlet which describes the design and methods of calculation for micarta gearing. The text and the tables make the booklet a useful reference. Publication No. F-4506-B is in accordance with the present recommendations of the American Gear Manufacturers' Association and is a revision of publication No. F-4506.

Heat-Treating Equipment. The Stanley P. Rockwell Co., 66 Trumbull St., Hartford, Conn., has published a circular on heat-treatment by the "Volcrit" method. It describes the Rockwell method of "Dilatometric" hardening. The apparatus and charts used are illustrated.

Lathes, Crankshaft. Wickes Brothers, Saginaw, Mich., are distributing Bulletin No. CS-1 which fully describes and illustrates the Wickes semi-automatic crankshaft lathes. The description is well prepared and profusely illustrated. Many typical set-ups are shown and described. Drawings show various methods for tooling the lathes. The arrangement of the booklet is very attractive and the description clearly and carefully prepared.

Material Handling. Eugene B. Clark, Clark Tructractor Co., Buchanan, Mich., has written an interesting and artistic little booklet entitled the "Clark Theory of Labor." Small cartoon cuts illustrate the booklet which discusses the value of proper methods for material handling as a means of reducing the cost of unskilled labor.

The cartoons are cleverly designed and set in the corners of the page. Each illustrates a man carrying some "back-breaking" load as an example and warning of the danger and bad economy involved.

Motors, Electric. General Electric Co., Schenectady, N. Y. Bulletins Nos. GEA-6, 71 and 246 on squirrel-cage, induction and synchronous motors, respectively, have been published by this company. The circulars show detailed drawings and photographs and contain brief paragraph descriptions of the various points of design. Control systems for the motors are also illustrated.

Oxygen. The Air Reduction Sales Co., 342 Madison Ave., New York, N. Y., is distributing a folder devoted principally to a reprint from Industrial Gases, published in London, for September, 1925. Various data on oxygen for welding apparatus are given.

Presses. The A. B. Farquhar Co., Ltd., York, Pa., has prepared Catalog No. 19 on Farquhar-Monarch hydraulic presses. The catalog, which contains twenty-four, 6½x10-in. pages, is well illustrated and gives short descriptions of accumulators, cylinders, various types of presses, pressure gages, pumps, retainers and trucks for use with the equipment.

Pumps, Air. Bridgeport Brass Co., Bridgeport, Conn. Bulletin No. 23, containing sixteen, 8x10½-in., pages, is devoted to the Bridgeport line of hand pumps for automobiles, motorcycles, bicycles and pressure lamps, and oil and grease guns. Brief descriptions and also photographs of each type are included in the book which is attractively prepared.

Pumps, Centrifugal. Pennsylvania Pump & Compressor Co., Easton, Pa. Bulletin No. 207 describes this company's multi-stage centrifugal pumps of the single-suction opposed impeller type. The bulletin is illustrated with many photographs, cross-sectional views and drawings of the various models, and the description is very full. The catalog conforms to the standards of previous bulletins issued by the company.

Pumps, Centrifugal. Morris Machine Works, Baldwinsville, N. Y. This company has published Bulletin No. 123 on Morris centrifugal pumps. The bulletin is composed chiefly of photographs of an impressive line of equipment for handling water, brine, oil, acids, pulp and chemical fluids.

Pyrometers. The Brown Instrument Co., 4571 Wayne Ave., Philadelphia, Pa., has compiled a book entitled "Instructions for Installation and Care of Thermo-Electric Pyrometers," containing sixty-eight, 6½x9½-in. pages. Price 50c. The book will form a valuable treatise on pyrometry and is divided into three sections on various phases of the subject: Thermo-electric pyrometry, installing pyrometers and the checking of pyrometer installations. The text goes systematically and deeply into the subject but at the same time can be easily understood. The purposes of various types of equipment and accessories are outlined and profusely illustrated. Sample problems are solved to assist in the understanding of the subject.

Tools, Chucking. The Warner & Swasey Co., Cleveland, Ohio, has published an impressive book containing one hundred and seventy-six, 6x9-in. pages, entitled "Turret Lathe Tools." The book is devoted to tool descriptions, method sketches and dimension drawings, and it contains descriptions and illustrations of one hundred and sixty-one tools for use on turret lathes.

The method sketches, of which there are over one hundred, contain many valuable suggestions for the setting up of tools and for the handling of a large variety of work. The seventy-four dimension drawings of the tools show the full details and are useful for laying out the tooling of turret lathe work and for the compiling of time study data.

The catalog is thumb-indexed for convenience and contains sections on chucking, bar and cross-slide tools, holding devices, dimension drawings, turret lathes, and data. It is printed on glossy paper and legible, attractive type has been used throughout the book. It will be found a very valuable reference book on turret lathe work and is an important contribution to this department of machine practice.

Forthcoming Meetings

National Foreign Trade Council. Thirteenth national foreign trade convention, Charleston, S. C., April 28, 29 and 30. O. K. Davis, secretary, India House, Hanover Square, New York.

American Gear Manufacturers' Association. Tenth annual meeting, Book-Cadillac Hotel, Detroit, May 13, 14 and 15. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Supply and Machinery Manufacturers' Association. Annual convention, Hotel Statler, St. Louis, week of May 17. F. D. Mitchell, secretary, 1819 Broadway, New York.

Society of Automotive Engineers. Summer meeting, French Lick Springs, Indiana, June 1 to 4. John Warner, manager of meetings, S. A. E., 29 West 39th St., New York City.

Iron and Steel Exposition. Annual exhibit of fuel, electricity, machinery and safety under the auspices of the American Society for Steel Treating, Hotel Sherman, Chicago, June 7, 8, 9 and 10. Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

National Association of Purchasing Agents. Eleventh annual convention and exposition, Ambassador Hotel and Auditorium, Los Angeles, Calif., June 9 to 12. W. L. Chandler, secretary, Woolworth Bldg., New York.

American Railway Association. Annual meeting of the Mechanical Division (Master Car Builders and Master Mechanics), Atlantic City, N. J., June 9 to 16. V. R. Hawthorne, secretary, 431 So. Dearborn St., Chicago.

Railway Supply Manufacturers' Association. Annual convention and exhibit in conjunction with Division V, Mechanical, of the American Railway Association, Young's Million Dollar Pier, Atlantic City, June 9 to 16. J. D. Conway, secretary, 1841 Oliver Bldg., Pittsburgh.

Society of Industrial Engineers. Thirteenth national convention, Bellevue-Stratford Hotel, Philadelphia, June 16, 17 and 18. Executive secretary, George C. Dent, 608 S. Dearborn St., Chicago.

American Society for Testing Materials. Haddon Hall Hotel, Atlantic City, N. J., June 21 to 25. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Society of Mechanical Engineers. Spring meeting, Palace Hotel, San Francisco, Calif., June 28 to July 1. Chairman of convention, Warren H. McBride, the California and Hawaiian Sugar Refining Co., 215 Market St., San Francisco.

American Railway Tool Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 1, 2 and 3. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foremen's Supply Association. Annual exhibit in connection with the annual convention of the American Railway Tool Foremen's Association, Chicago, Sept. 1, 2 and 3.

Machine Tool Exhibit. Sixth annual exhibition of machine tools at the Mason Laboratory, Yale University, under the auspices of the New Haven Section, A.S.M.E., the mechanical engineering department of the Sheffield Scientific School, and the New Haven Chamber of Commerce, Sept. 7 to 10. Administrative office, New Haven Machine Tool Exhibit, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Eighth national steel and machine tool exposition, Municipal Pier, Chicago, Sept. 20 to 24. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Foundrymen's Association. Second international foundrymen's congress, Detroit, Sept. 27 to Oct. 1, under the auspices of the American Foundrymen's Association. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

The Weekly Price Guide

Rise and Fall of the Market

THE quiet condition of the pig-iron market has had little effect upon price during the past week. Steel structurals, automobile sheets and pipe are unusually active in inquiry and demand at the present time. Firmness is developing in steel bars, plates, wire products and tin plate. Mill quotations in the principal hot-rolled products continue unchanged. With the exception of lead, antimony and copper wire the non-ferrous products are holding to the Apr. 16 price levels at warehouses throughout the country.

(All prices as of April 23)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	24.27
Southern Ohio No. 2	24.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.37
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	23.76
Virginia No. 2	29.17
Basic	22.76
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	26.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	21.27
Basic	21.27
Bessemer	21.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	5.00@5.25
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.50	3.89	3.25	3.50
No. 12	2.55	3.94	3.30	3.55
No. 14	2.60	3.99	3.35	3.60
No. 16	2.70	4.09	3.45	3.70
Black				
Nos. 18 to 20	3.05@3.15	4.30	3.90	3.90
Nos. 22 to 24	3.10@3.20	4.35	3.95	3.95
Nos. 26 and 27	3.15@3.25	4.40	4.00	4.00
No. 28	3.25@3.35	4.50	4.10	4.10
Galvanized				
No. 10	3.60	4.65	4.25	4.25
Nos. 12 to 14	3.70	4.75	4.35	4.35
No. 16	3.85	4.90	4.50	4.50
Nos. 18 to 20	4.00	5.05	4.65	4.65
Nos. 22 to 24	4.15	5.20	4.85	4.80
Nos. 26 and 27	4.30	5.35	5.10	4.95
No. 28	4.60	5.65	5.25	5.25

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	58%	45%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	55%	42%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches External	Diameter in Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness Decimal	B.W.G. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.10
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60@65%	55%	50%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. *Flat, 1/16@¼-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.25
Tin, 5-ton lots, New York			65.00
Lead (up to carlots) E. St. Louis	7.60	New York	8.75
Zinc (up to carlots) E. St. Louis	6.95	New York	8.00

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	18.50	23.50	26.00
Copper sheets, base	22.50	22.50	22.50
Copper wire, base	19.25	16.50	16.00
Copper bars, base	22.12½	22.12½	21.87½@22.12½
Copper tubing, base	24.25	24.25	24.25
Brass sheets, base	18.87½	18.87½	18.87½
Brass tubing, base	23.50	23.50	23.50
Brass rods, base	16.62½	16.62½	16.62½
Brass wire, base	19.37½	19.37½	19.37½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	27.00	27.00	27.02
Zinc sheets (casks)	12.00	12.60@12.95	12 27
Solder (½ and ½), (case lots)	40.12½	42.00	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	81.62½
Commercial genuine, intermediate grade	56.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	14.00

Nickel, f.o.b. refinery, cents per lb.:

Ingots	31.00	Electrolytic	38.00
Shot	32.00		

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.00@12.50	11.25	10.75@11.25
Copper, heavy, and wire	11.37½@11.87½	11.50	10.25@10.75
Copper, light, and bottoms	9.62½@10.12½	10.00	9.50@10 00
Heavy lead	7.00@ 7.25	7.50	6.25@ 6.75
Tea lead	5.00@ 5.25	5.00	5 00@ 5.50
Brass, heavy, yellow	7 25@ 7.50	7.25	7.00@ 7.50
Brass, heavy, red	9.50@ 9.75	9.50	8.25@ 8.75
Brass, light	6.00@ 6.25	6.00	6.25@ 6.75
No. 1 yellow rod turnings	8.25@ 8.50	8.00	7.50@ 8.00
Zinc	4.50@ 4.75	4.75	4.00@ 4.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade: IC,	14x20	$12.10	$11.45	$11.50
"A" Grade: IC,	14x20	9.70	9.40	9.50
Coke Plates—Primes—Per box 100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box IC,	14x20	7.75@8.00	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 13@0. 17½	$0.18	$0.15@0.20
Cotton waste, colored, per lb.	.10@ .14	.17	.12@.17
Wiping cloths, washed white, per lb	.18	36.00 per M	.16
Sal soda, per 100 lb. keg	2.05	2.25	2.75*
Roll sulphur, per 100 lb.	3.60†	3.35	4.25‡
Linseed oil, per gal., 5 bbl. lots	.83½	.96	.85
Lard cutting oil, 25% lard, per gal.	.55	.50	.48
Machine lubricant, medium-bodied (55 gal. metal bbl.), per gal.	.35	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*In 175 lb. kegs. † Per 150 lb. lot. ‡In 425 lb. barrels

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.0415
Brass rods	per lb	.1662½	.1687½	.1587½
Solder (½ and ½)	per lb.	.4012½	.4025	.37
Cotton waste	per lb.	.13@ 17½	.15@.22	15@22
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	7.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.38
Lard cutting oil	per gal.	.55	.55	.60
Machine oil	per gal.	.35	.35	.33
Belting, leather, medium	off list	40–5%	40–5%	30–10%
Machine bolts up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.56	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	29.48	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.45	1.49
Cloth	3.55	3.55	3.20
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.00@ 3.25
Coke, prompt foundry, Connellsville	per net ton		4.50@ 5.00
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16.75	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{7}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x¼-in., 2c. each. Discount 70% for $\frac{9}{16}$-in and smaller and 65% for ¾-in. and larger.
Case hardened ½x¼-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ⅞-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4$\frac{1}{16}$-in. $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb for 1½ to 2-in. long, all diameters, 25c.; ¾-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ¾-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ga., Rome—Standard Stove & Range Co., E. P. Grant, Mgr.—sheet metal working equipment, moulding machines, grinders, tumbling barrels, etc., for proposed new plant. Estimated cost $40,000.

Ill., Chicago—Englewood Optical Co., 60th St. and Eggleston Ave. — small shaper, Rhodes type, small bench milling machine bench lathe about 6 to 7 in. swing, screw cutting, rivet, Stark or Wade type, not back geared.

Mich., Detroit—C. B. Haven Co., 620 St. Antoine St., C. B. Haven, Purch. Agt.—bench lathe and 3 or 4 small engine lathes for machine shop.

Mich., Saginaw—Lufkin Rule Co.—complete equipment for the manufacture of steel tapes, rules, etc. for proposed 2 story factory.

O., Columbus—Melvin's Craft Shop, 184 West Spring St., c/o O. L. Melvin,—(brass products)—one 12 in. lathe, two buffers and one polisher.

Tex., Houston—Texas Tinners Supply Co. tin shop machines, hand power, also emery stands, 8 in. wheels, small lathes, electric drills, etc.

Wis., Racine—Belle City Malleable Iron Co., Kewaunee St., C. S. Anderson, Mgr.—additional foundry equipment for proposed second unit to foundry, 1 story, 116 x 202 ft.

Wis., Waukesha—Butler Bin Co., Lincoln Ave.—one double end punch and 6 motors for proposed 1 story, 70 x 200 ft. factory.

Que., Montreal — Automobile Ltd., 232 Sanquinet St., J. B. Archambault, Purch. Agt.—screw machine and other equipment.

Que., Montreal—Duplenis & Bezier, 27 St. Alexander St.—(machinists)—shaper and other equipment.

Que., Montreal—I. Gourd, 5 Preston St.—tool room lathe.

Que., Montreal—Leduc Electric Ltd., 55 Cote St., U. A. Leduc, Purch. Agt.—squaring shear.

Que., Montreal—O. S. Lenoir Reg'd, 222 Sherbrooke St. W.—bench tools and other equipment for repair shop, etc.

Opportunities for Future Business

Calif., Los Angeles—T. B. Keim, Jr., Haas Bldg., Archt., is receiving bids for the construction of a 4 story, 100 x 155 ft. garage and auto sales building at 12th and Figueroa Sts., for A. P. Mitchell, et al.

Conn., Hartford—Nirenstein & Schwartz, 1247 Main St., awarded contract for the construction of a 1 story, 61 x 154 ft. garage and repair shop. Estimated cost $40,000. Noted Jan. 28.

Conn., New Britain — Landers, Frary & Clark, Commercial and Center Sts., manufacturers of vacuum cleaners, awarded contract for the construction of a 6 story, 60 x 260 ft. with 60 x 60 ft. wing manufacturing buildings.

Conn., New Haven—J. T. Suisman, 1026 Main St., Hartford, plans the construction of a 2 story factory at 51 Chapel St., here. Storrs & Feinberg, 1127 Main St., Hartford, Archts. Graybar Electric Co., subsidiary of Westinghouse Electric Mfg. Co., 150 Broadway, New York, N. Y., lessee.

Conn., New London—Crown Sheet Metal Works, 186 Bank St., is receiving bids for the construction of a 2 story, 50 x 100 ft. shop. Estimated cost $50,000. F. DeGange, 60 Ocean Ave., Archt.

Conn., Wallingford—W. A. Ives Mfg. Co., C. J. Benham, Pres., Cherry St., plans to rebuild factory for manufacture of bits and augurs, destroyed by fire. Estimated cost $40,000. Architect not selected.

Ill., Decatur—Wabash Railway Co., Railway Exchange Bldg., St. Louis, Mo., awarded contract for the construction of a group of locomotive repair shops 150 x 800 ft., 50 x 100 ft. and 100 x 100 ft., all 1 story. Estimated cost $1,000,000. R. H. Howard, St. Louis, Mo., Ch. Engr.

Ill., Peoria—South Side Foundry Co., 2900 South Washington St., plans the construction of a 2 story, 60 x 80 ft. iron foundry. Estimated cost $20,000. Private plans.

Ill., Rockford—Mechanic Machine Co., awarded contract for the construction of a 6 story, 80 x 140 ft. factory at 9th Ave. and 18th St. Estimated cost $175,000.

Ind., Anderson—Anderson Stove Works, awarded contract for the construction of 50 x 150, 60 x 70 and 20 x 80 ft. additions to plant, all 1 story. Estimated cost $33,000.

Ind., Indianapolis—Gates Mfg. Co., 835 North Meridian Ave., manufacturers of automobile tops and equipment, awarded contract for the construction of a 2 story, 80 x 100 ft. addition to plant. Estimated cost $35,000.

Md., Baltimore — Club Aluminum Co., 1238-1250 Fullerton Ave., Chicago, Ill., manufacturers of aluminum kitchen equipment, plans the construction af a plant at 3500 East Biddle St., here.

Mass., Chelsea (Boston P. O.)—H. Cloper, c/o S. S. Eisenberg, 44 Cornhill, Boston, Archt., is receiving bids for the construction of a 1 story, 75 x 175 ft. repair and service garage at 62 Broadway here. Estimated cost $40,000.

Mass., Everett (Boston P. O.)—P. Levine, 29 Creston St., Roxbury, will build a 1 story, 150 x 375 ft. repair and service garage at Ferry St. and Glendale Square here. Estimated cost $175,000. Miller & Levi, 46 Cornhill, Boston, Archts.

Mass., Springfield—Westinghouse Electric & Mfg. Co., Page Blvd., plans to expend $350,000 to $400,000 for improvements, including the construction of a 3 story, 54 x 300 ft. administration building, 4 story addition to main factory, new building for machining and storing castings, enlarging punch press shop and remodeling present office building, etc., at East Springfield Works.

Mass., West Roxbury (Boston P. O.)—J. J. Kelleher, 179 Summer St., Boston, awarded contract for the construction of a 1 story, 100 x 110 ft. repair and service garage at 5314 Washington St. here. Estimated cost $65,000.

Mich., Albion—Michigan Electric Railways Co., car shops, outside of the city limits, were partially destroyed by fire. Loss is estimated at $750,000. H. D. Sanderson, Jackson, Ch. Engr.

Mich., Detroit—Detroit Stove Works, East Jefferson Ave., will receive bids about May 3 for the construction of a 2 story, 85 x 100 ft. enameling plant in connection with stove factory. C. Kotting, 2306 Dime Bank Bldg., Archt.

Neb., Omaha — Metropolitan Utilities Dist., T. A. Leisen, Gen. Mgr., City Hall, will soon award contract for the construction of a 4 story service building including shops, garage, etc., at 20th and Center Sts. Estimated cost $225,000. Noted Nov. 26.

N. J., Jersey City—P. Kozans, is having plans prepared for the construction of a 1 story machine shop at 157 St. Paul's Ave. Estimated cost $50,000. G. A. Flagg, 665 Newark Ave., Archt.

N. J., Riverton—Motor Equipment Corp., 2216 Chestnut St., Philadelphia, Pa., plans the construction of a factory here. Estimated cost $70,000. Architect and engineer not selected.

N. Y., Long Island City—J. Heinrichs Corp., 948 Broadway, New York, manufacturers of coffee urns, will soon receive bids for the construction of a 3 story plant here. Estimated cost $75,000. C. S. Howell, 11 East 45th St., New York, Archt.

N. Y., New York—J. DeHart, 1041 Fox St., will build a repair and service garage on Cromwell Ave. Estimated cost $75,000.

O., Ashtabula—American Fork & Hoe Co., S. Chapin, Purch, Agt., B. F. Keith Bldg., Cleveland, awarded contract for the construction of a 3 story, 40 x 100 ft. addition to factory here. Estimated cost $40,000. Noted Mar. 11.

O., Canton—Ralph Hay Motor Car Co., 134 McKinley Ave. N.W., awarded contract for the construction of a 1 story, 114 x 149 ft. garage and sales building at Hazlette and Tuscarawas St. W. Estimated cost $150,000.

Okla., Oklahoma City — J. B. Rolater, Shops Bldg., had plans prepared for the construction of a 3 story, 140 x 150 ft. assembling plant on Sixth St. Estimated cost $160,000. Architect not selected. Chevrolet Motor Co., lessee.

Pa., Philadelphia—Link Belt Co., Hunting Park Ave. and Nicetown Station, awarded contract for the construction of a 1 story, 44 x 146 ft. addition to machine shop at Hunting Park Ave. and Blabon St.

Pa., Philadelphia — Philadelphia Rapid Transit Co., Eighth and Dauplin Sts., will soon award contract for the construction of a 1 story, 150 x 340 ft. garage at Comly and Pennsylvania Sts. Private plans.

Pa., Pittsburgh—Steel City Electric Co., 1207 Columbus Ave., awarded contract for the construction of a 2 story, 40 x 60 ft. manufacturing building. Estimated cost $40,000.

Pa., Sharon—Sharon Steel Hoop Co., S. P. Ker, Pres., plans to electrify mills, 8 and 10 and remodel unit 14, also the construction of a gas plant and boiler House. Estimated cost $500,000. G. S. Warren, c/o owner, Engr.

Tex., Houston—Oklahoma Steel Castings Co., E. H. Cornelious, Pres., Tulsa, Okla., has acquired a site and plans the construction of a 1 story foundry, here. Estimated cost $50,000. Private plans.

Va., Roanoke—Norfolk & Western Ry. Co., awarded contract for the construction of a 100 x 200 ft. machine shop at East End Yard.

Wis., Appleton—Appleton Iron & Brass Co., A. Wiese, Mgr., 1704 East John St., is having plans prepared for the construction of a 1 story, 60 x 100 ft. shop. Estimated cost $40,000. Private plans.

Wis., Madison—International Harvester Co., 606 South Michigan Blvd., Chicago, Ill., will receive bids until May 6 for the construction of a 1 story, 120 x 130 ft. service station here. Estimated cost $70,000. W. D. Price, c/o owner, Archt. Noted Apr. 22.

Wis., Milwaukee — Loeffelholz Co., 170 Clinton St., awarded contract for the construction of a 1 story, 47 x 140 ft. foundry. Estimated cost $40,000. Noted Apr. 15.

Wis., Two Rivers—Hamilton Mfg. Co., manufacturers of steel and wood furniture for printing houses, etc., will soon award contract for the construction of a 5 story, 30 x 120 ft. and 1 story, 120 x 250 ft. factory buildings. Lockwood, Greene & Co., 400 North Michigan Blvd., Chicago, Ill., Archts. and Engrs.

Wis., Waukesha — Quality Aluminum Casting Co., Lincoln Ave., awarded contract for the construction of an 80 x 280 ft. addition to plant. Noted Apr. 22.

Wis., Waukesha—Waukesha Motor Co., West St. Paul Ave., awarded contract for the construction of a 1 story, 68 x 154 ft. addition to factory. Estimated cost $40,000.